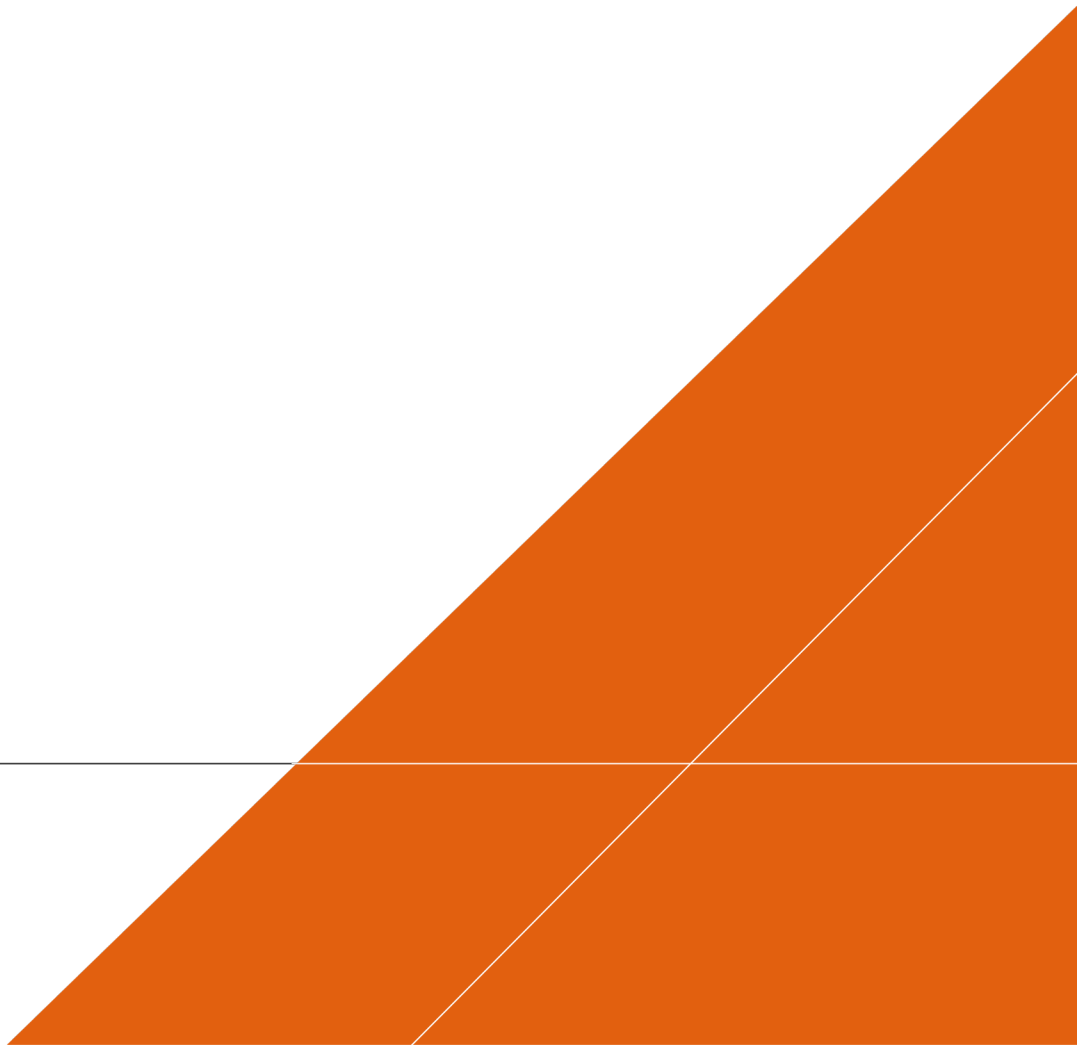
ARCADIS Design & Consultancy for natural and built assets

CAIRNCROSS WASTE MANAGEMENT FACILITY – RESPONSE TO SUBMISSIONS REPORT APPENDIX A

AMENDED PROPOSAL DESCRIPTION

06 DECMBER 2018



Incorporating Hyder

CONTENTS

Prelude

This appendix of the RtS has been prepared to provide a consolidated description for the works and uses for which approval is sought. This section combines both the Proposal (presented in the EIS) and the Amended Proposal (presented within this RtS).

The Proposal description (Section 5 of the EIS) has been used as the basis for this appendix. All alterations to works, included in the Amended Proposal (Section 6 of the RtS), have been identified with words proposed to be deleted shown in ~~***bold italic strike through***~~ and words to be inserted are shown in ***underlined bold italics***.

This appendix replaces, and therefore supersedes, the Proposal description provided in Section 5 of the EIS, as amended by the Amended Proposal description in Section 6 of this RtS.

1 PROPOSAL DESCRIPTION

This section provides a detailed description of the design of the ***Amended*** Proposal, the proposed landfill cell formation techniques to be utilised and the operational procedures to be implemented.

This section is based on, and should be read in conjunction with, the Concept Design Report and associated design drawings (see Appendix B ***of the EIS***). The design has been developed to comply with the NSW EPA's *Environmental Guidelines, Solid Waste Landfills* (2016). All design drawings are preliminary and subject to detailed design.

1.1 Proposal overview

PMHC is seeking approval under Part 4, ~~***Division 4.1***~~ ***Division 4.7*** of the EP&A Act to expand the existing Cairncross Landfill located at the Cairncross WMF.

The ***Amended*** Proposal will receive waste from all areas within the PMHC LGA including the major townships of Port Macquarie, Wauchope and Camden Haven. Waste will include general solid waste (i.e. putrescible and non-putrescible materials) and asbestos from domestic and C&I sources.

The key works for which approval is sought include:

- Progressive landfill cell construction, operation and rehabilitation of three landfill stages (Stages 1-3) including:
  - Clearing of ***3.4 ha*** of existing vegetation
  - Construction of access tracks
  - ***Construction of defendable spaces for bushfire protection***
  - Earthworks for cell formation including extraction and stockpiling of materials and the reapplication to form the leachate barrier (cell liner) as well as for daily, intermediate and final cover
  - Installation of leachate management structures including the leachate barrier, collection, storage and disposal system
  - Construction of a rising main to transfer leachate to the adjacent sewerage treatment plant (STP)1
  - Installation of a stormwater management system
  - ***Installation of a groundwater management system***

[1] The STP construction is proposed to commence in 2018 and is being designed to accept leachate from Stages 1-3 (and E) of the Proposal.

  - Progressively increasing the annual waste acceptance rate at the landfill
  - Signage and other ancillary works
  - Rehabilitation of closed cells.
- Delineation and ongoing management of an approximately 50 m wide Koala connectivity corridor around the south-western border of the site[2].

Stages 1-3 of the ***Amended*** Proposal are expected to receive a total of approximately 3.7 million cubic metres of additional waste over the life of the expanded landfill and would be developed in stages as described in Section 5. The overall landfill life expectancy is 36 years (i.e. Stage 3 is expected to reach capacity in approximately 2056).

1.1.1 Landfill layout and stages

As discussed in Section 1.1, it is proposed that the landfill expansion would be developed in three stages, from 2020 - 2056. Stages 1 - 3 are estimated to have capacity for approximately 3.7 million cubic metres. The proposed landfill layout and stages are shown in Figure 1-1 through Figure 1-5.

The staging boundaries have been modified from the original design contained within the *Cairncross Waste Management Facility Landfill Environment Management Plan (2001)* (2001 LEMP) (Connell Wagner, 2001) to better reflect the natural, final and floor levels of the landfill site, expected waste volumes and operational requirements. A general even distribution of area was also considered in the final stage layout.

The area consisting of Stage 1 and Stage 2 are within a catchment that drains south to land owned by State Forests NSW (Forestry Corp). The area within Stage 3 is in a catchment which drains to the east through Rawdon Creek Nature Reserve. The final leachate collection system also dictated the need to split catchments and define stages as shown below.

The staging boundaries have also been modified to allow for an approximately 50 metres wide Koala corridor to allow for the movement of Koalas in the south-east to the north-west of the site (see Figure 1-2 and Figure 1-12).

The current operational Stage E landfill is progressing south towards the northern boundary of Stage 1 and 3 and is due for completion in approximately 2019.

[2] It is noted that Sediment Basin 2 Protrudes approximately 20 m over a minor portion of the corridor. Further detail regarding the nature, implications and potential contingencies associated with this are provided in Section 4 of this RtS.

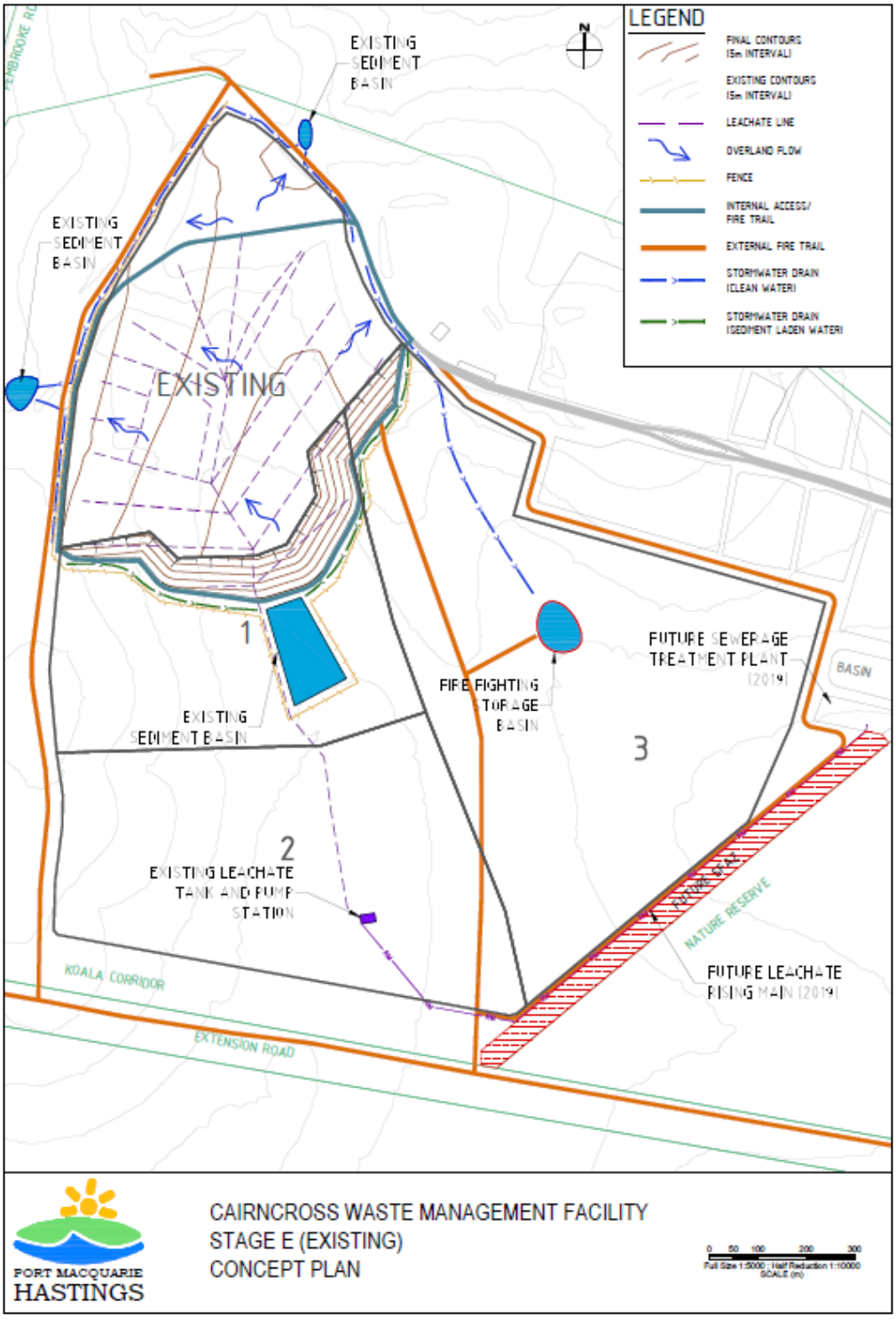


Figure 1-1 Proposed landfill layout and stages (Stage E)

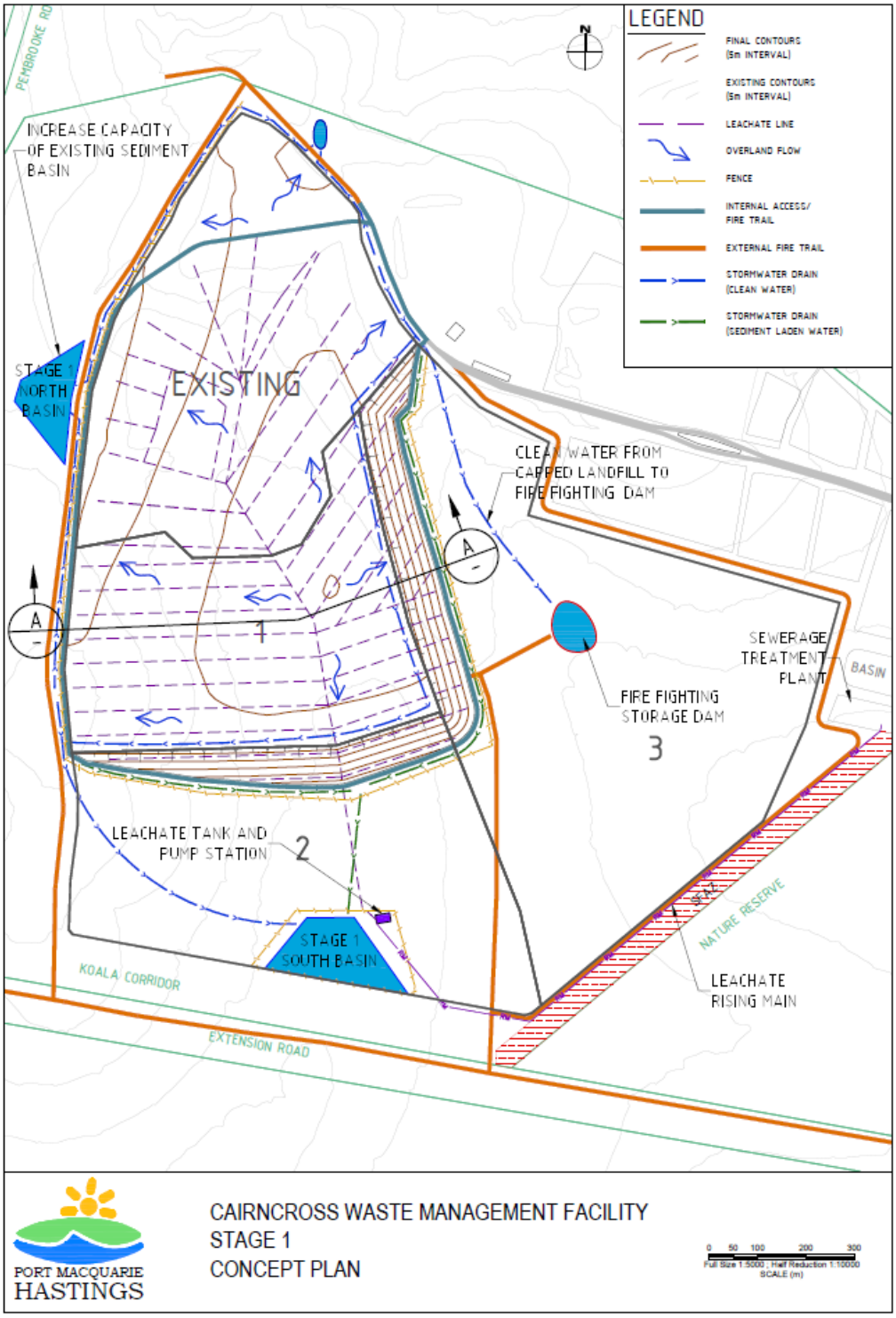


Figure 1-2 Proposed landfill layout and stages (Stage 1)

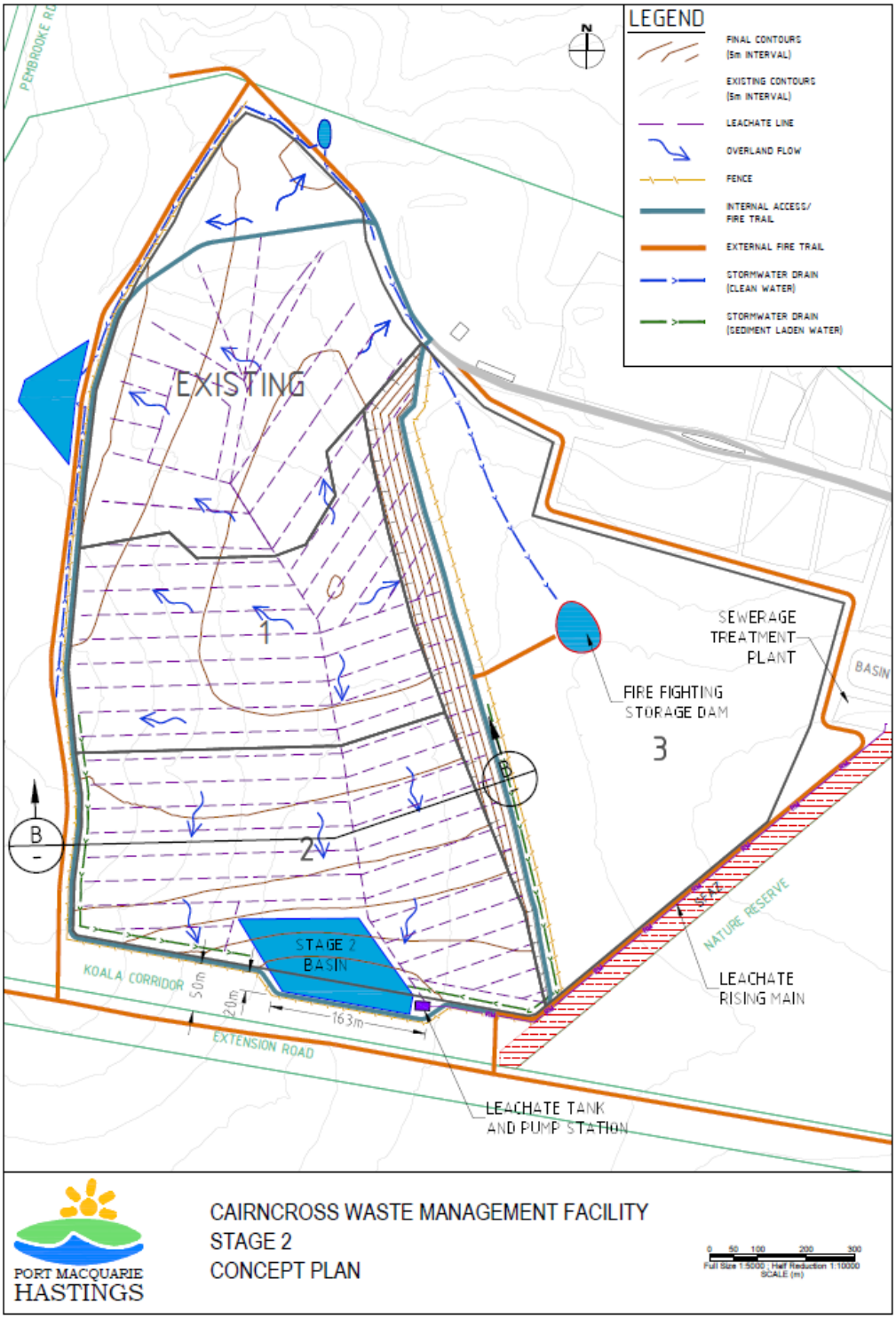


Figure 1-3: Proposed landfill layout and stages (Stage 2)

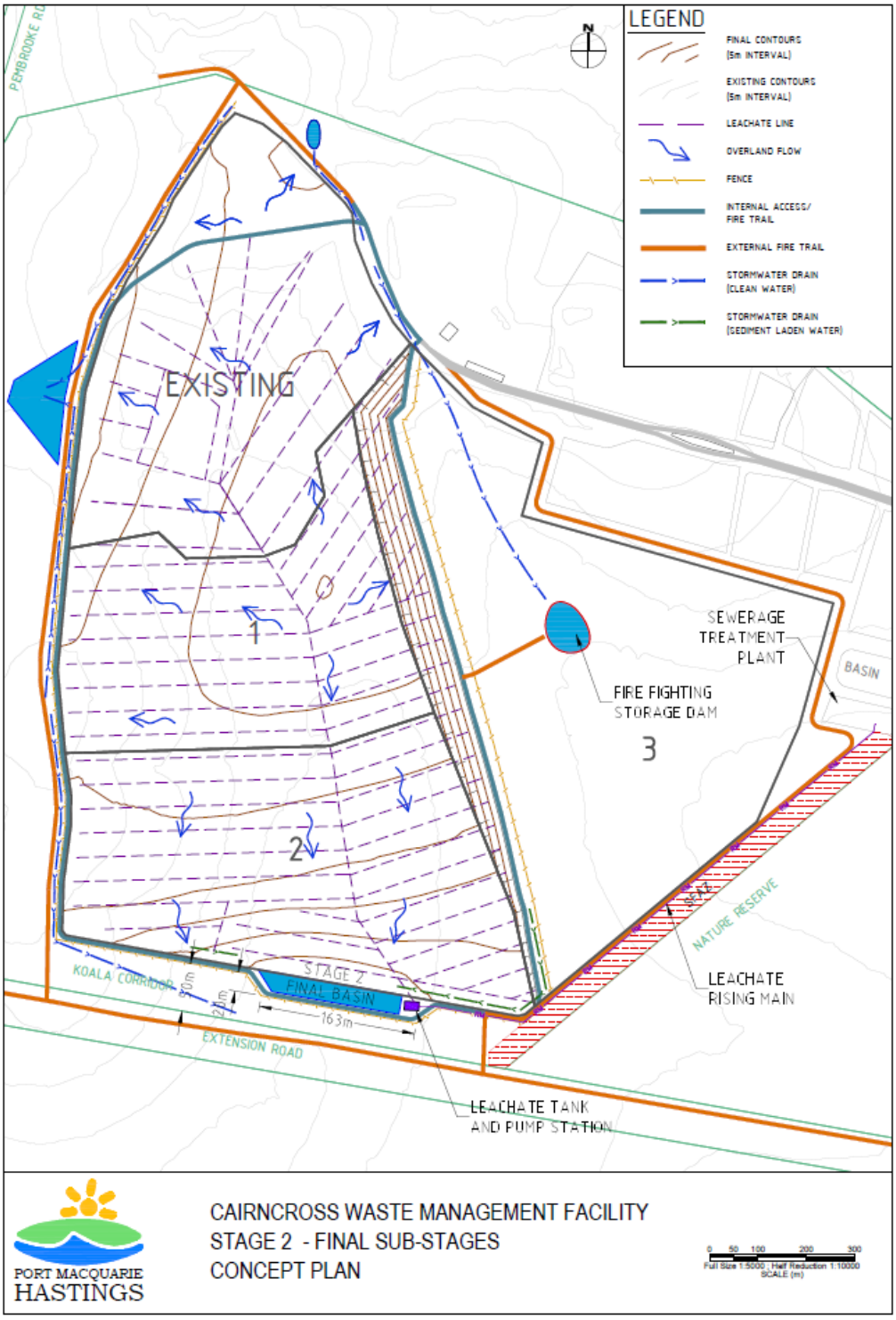
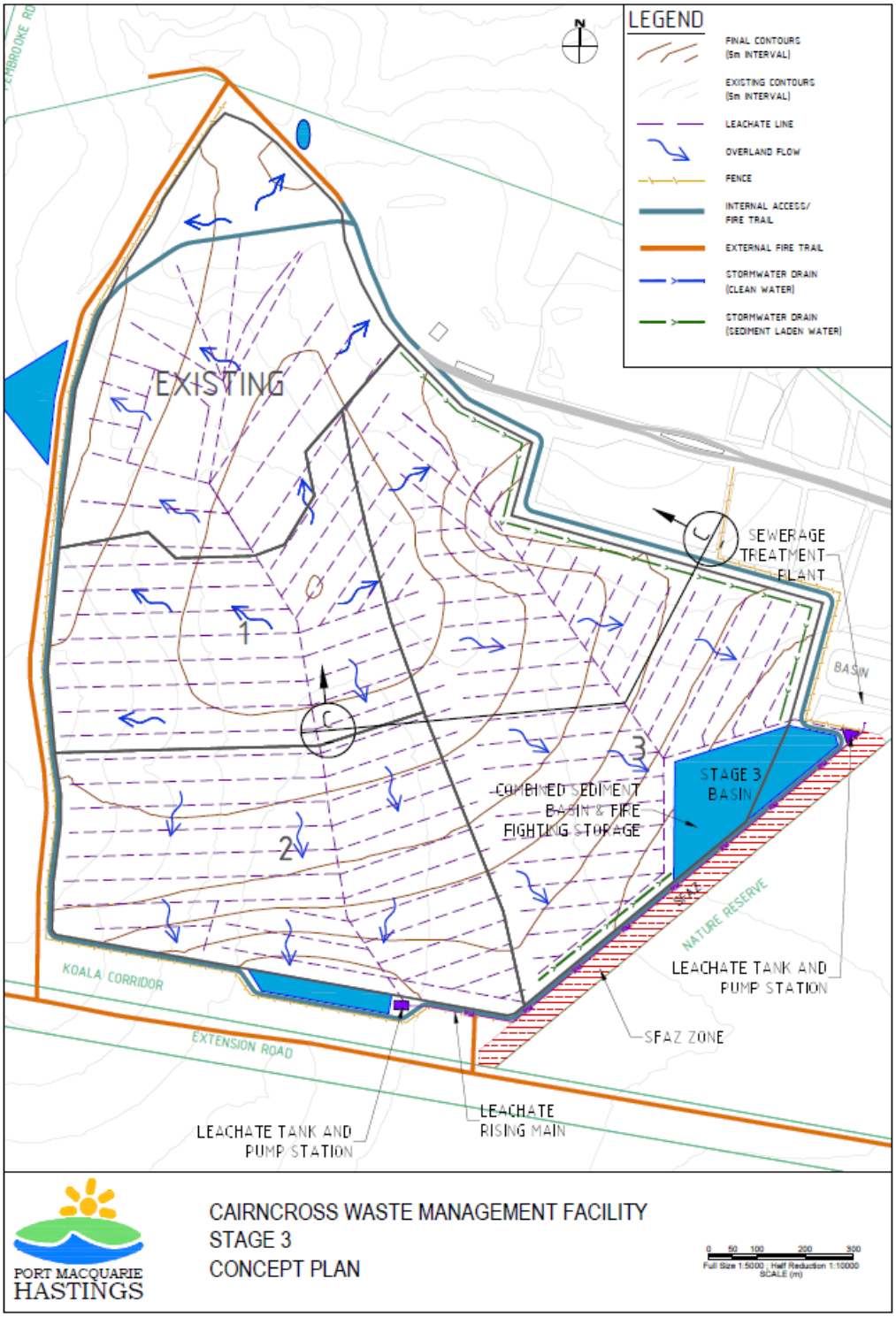


Figure 1-4 **Proposed landfill layout and stages (Stage 2 – Final Sub-Stages)**


LEGEND
FINAL CONTOURS (5m INTERVAL)
EXISTING CONTOURS (5m INTERVAL)
LEACHATE LINE
OVERLAND FLOW
FENCE
INTERNAL ACCESS/ FIRE TRAIL
EXTERNAL FIRE TRAIL
STORMWATER DRAIN (CLEAN WATER)
STORMWATER DRAIN (SEDIMENT LADEN WATER)
N
EXISTING
1
2
3
SEWERAGE TREATMENT PLANT
BASIN
STAGE 3 BASIN
COMBINED SEDIMENT BASIN & FIRE FIGHTING STORAGE
NATURE RESERVE
KOALA CORRIDOR
EXTENSION ROAD
LEACHATE TANK AND PUMP STATION
LEACHATE RISING MAIN
LEACHATE TANK AND PUMP STATION
SFAZ ZONE
PORT MACQUARIE HASTINGS
CAIRNCROSS WASTE MANAGEMENT FACILITY
STAGE 3
CONCEPT PLAN
0 50 100 200 300
Full Size 1:5000 , Half Reduction 1:10000
SCALE (m)

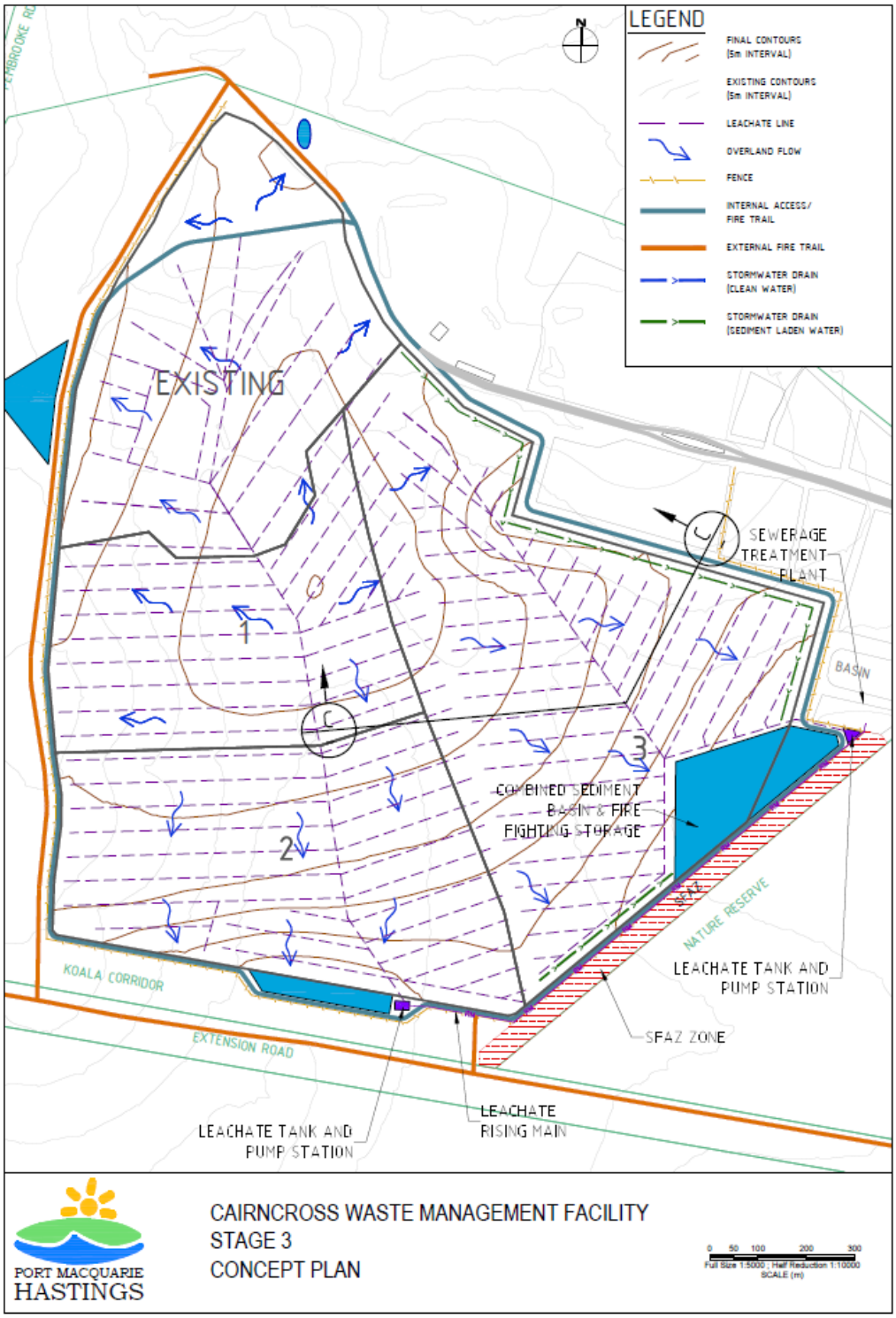


Figure 1-5: Proposed landfill layout and stages (Stage 3)

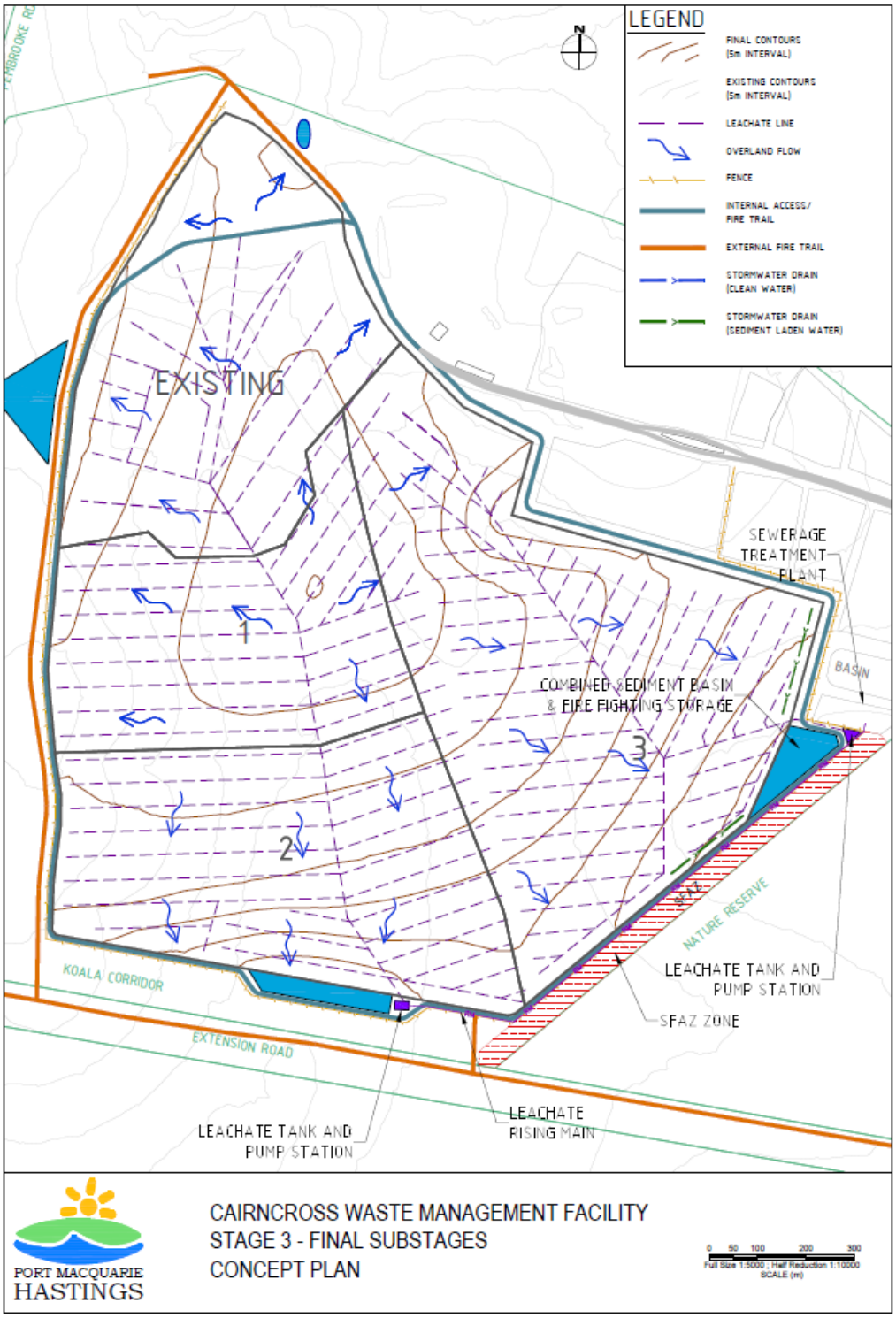


***Figure 1-6** Proposed landfill layout and stages (Stage 3 – Final substages)*

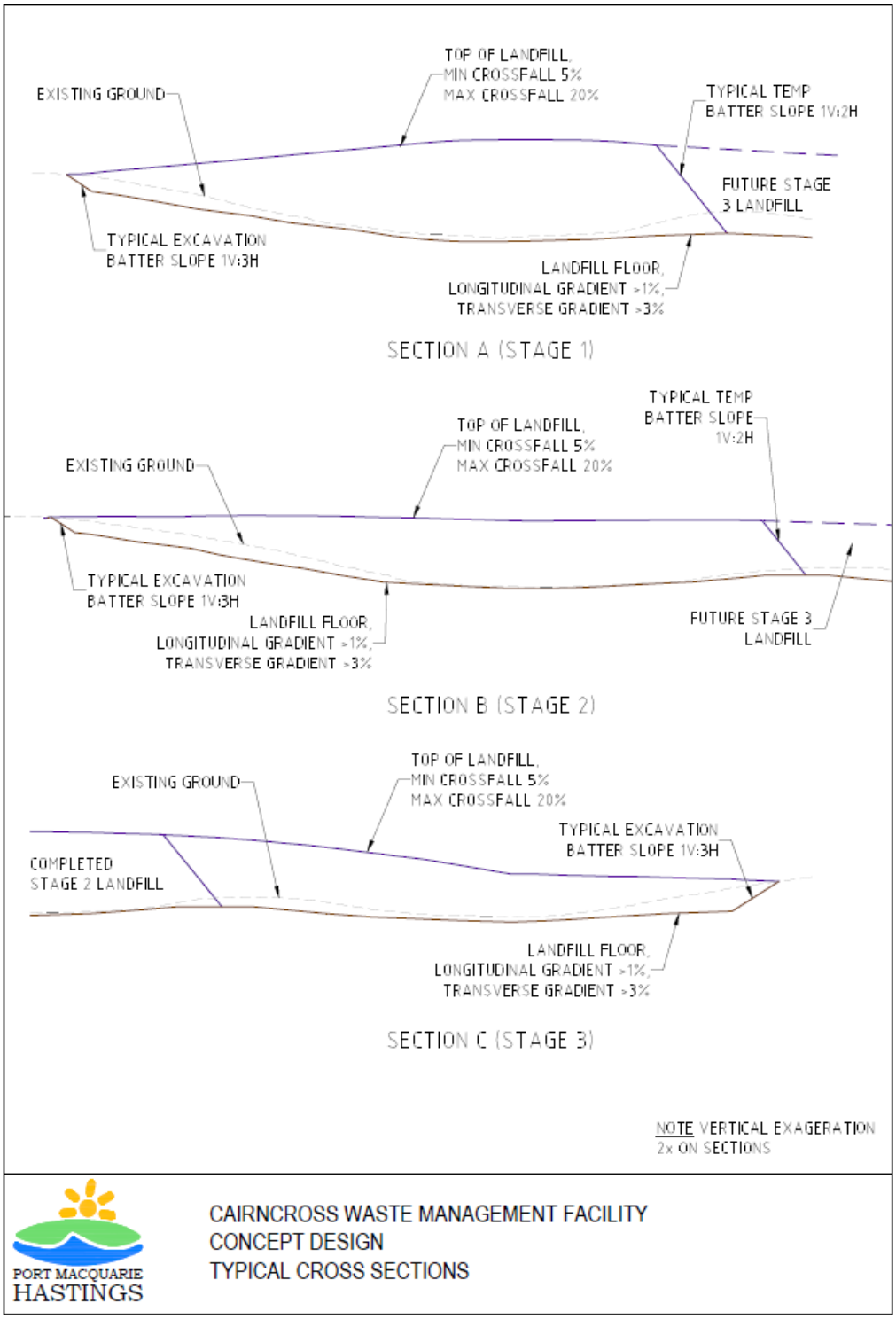


Figure 1-7: Proposed landfill typical cross sections

1.1.2 Sequencing of stages

Landfill excavation, liner construction and the installation of the leachate collection systems will continue to be undertaken in a staged manner to allow progressive capping of the previous landfill cell. To manage the operational aspects of this process, each stage has been further divided into sub-stages as shown on Figure 1-6.

The sub-stage areas have been selected based on operational experience gained from Stage E. The timeframes for development sequence are considered to be operationally efficient for clearing, excavation, liner preparation, waste filling, capping and closure (of the relevant sub-cell).

The sub-stages also include the benefit of minimising disturbed areas by reducing stormwater runoff and erosion, and limiting leachate generation by controlling the active landfill area.

A 'typical' development sequence is detailed in Table 1-1.

Table 1-1 Typical development sequence

Year	2047	2048	2049	2050
Construction of Cell 3A	X			
Landfilling Cell 3A		X		
Capping and closure of Cell 2F	X	X		
Clearing Stage 3B		X		
Construction of Cell 3B		X		
Landfilling Cell 3B			X	
Capping and closure of Cell 3A		X	X	
Clearing Stage 3C			X	
Construction of Cell 3C			X	
Landfilling Cell 3C				X

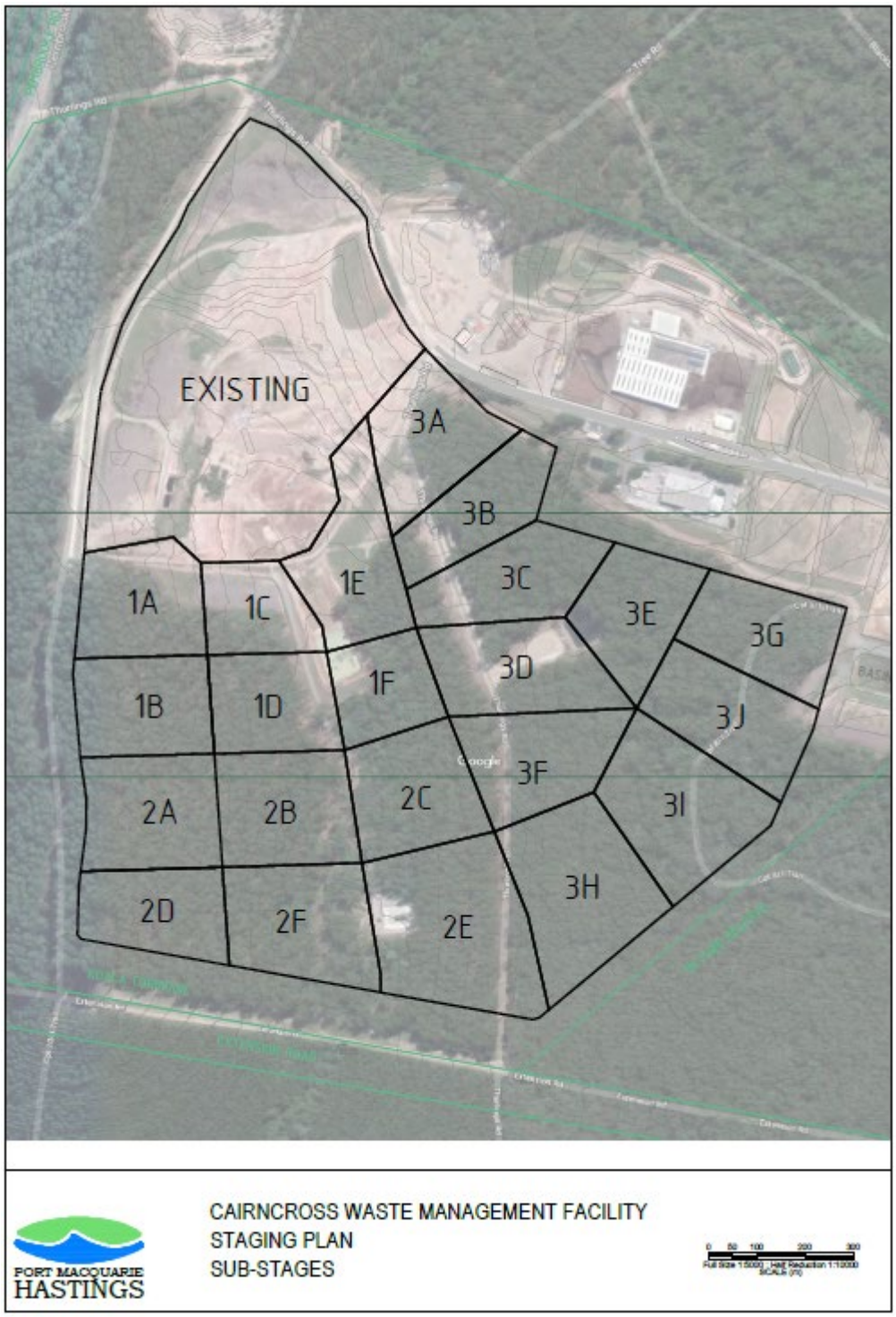


Figure 1-8 Proposed landfill (sub-stages)

1.1.3 Landfill floor level

The landfill floor level for Stages 1, 2 and 3 has been modified from the original design contained within the 2001 LEMP to better reflect groundwater conditions, maximisation of landfill void volume, and longitudinal/transverse floor gradients.

Trace Environmental (Trace) prepared the Hydrogeological Assessment, Cairncross Landfill Expansion (2016) report (Appendix F ***of the EIS***), that identifies 'average' long term groundwater and 'maximum' groundwater levels across the site. The adjusted floor level was set a minimum of two metres above the average long term groundwater level. This design parameter is in accordance with best practice requirements from the Victorian EPA guidelines, Siting, Design, Operation and Rehabilitation of Landfills; Best Practice Environmental Management, Publication 788.3 (August 2015) (Victorian EPA, 2015). The Victorian EPA guidelines were used given NSW EPA did not have any groundwater clearance/buffer guidelines at the time.

Floor levels were further adjusted where possible to maximise the landfill void volume whilst maintaining longitudinal gradients >1 percent, and transverse gradients >3 percent. Proposed landfill floor excavation levels are shown on Figure 1-7.

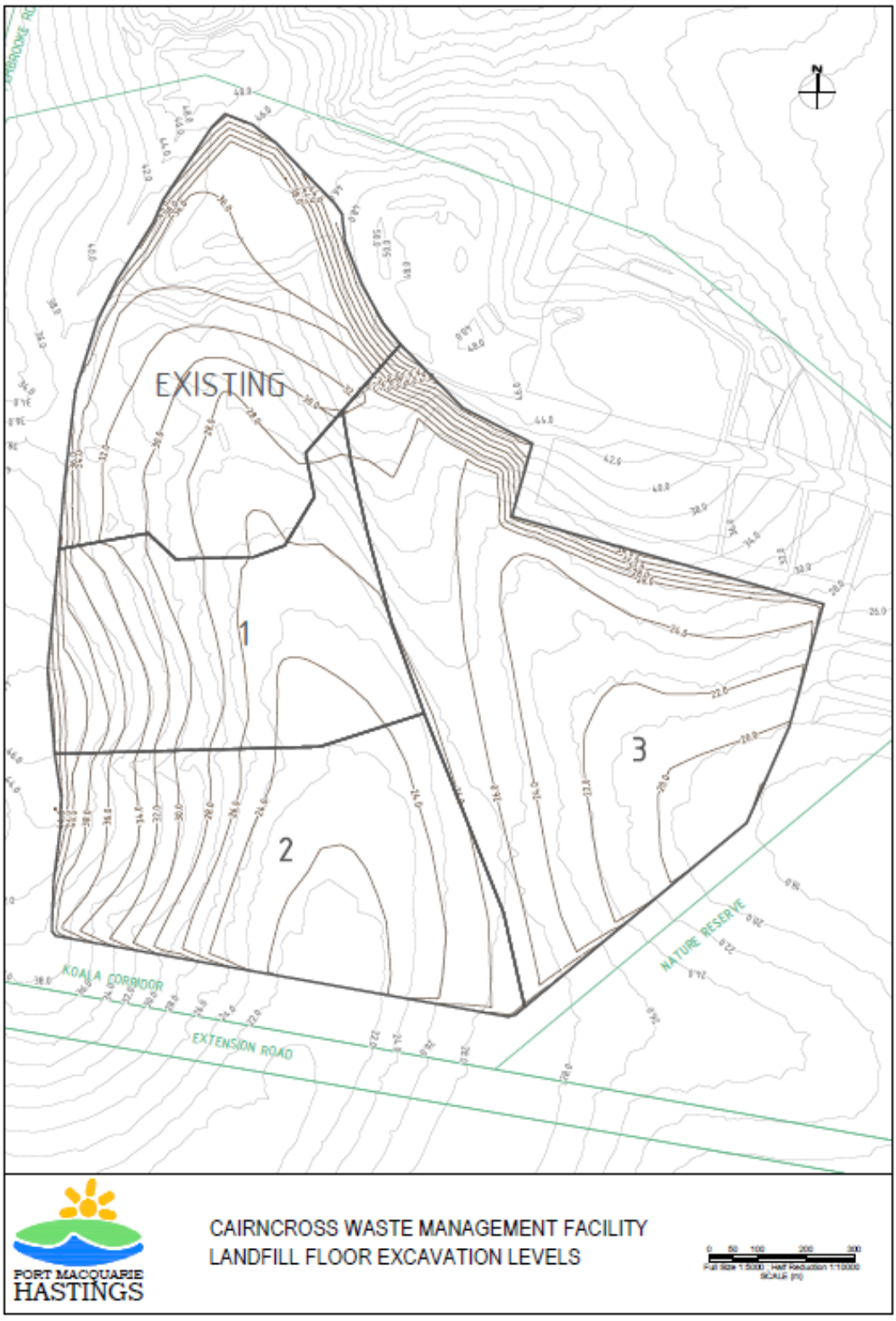


Figure 1-9 Proposed landfill floor excavation levels

1.1.4 Groundwater interception

As noted above, the revised landfill floor level was generally set at two metres above the 'average' long term groundwater level as detailed in the Hydrogeological Assessment (Trace, 2016).

During above 'average' groundwater level conditions, the excavation of the landfill cells may intercept groundwater, particularly in the south-western corner of the site (Stages 1 and 2) (Trace, 2016).

Figure 1-8 shows the estimated depths and locations where groundwater may be encountered by the landfill excavation. ~~***In order to avoid any risk of groundwater infiltration into the landfill cells, a gravel/rubble trench is proposed around the perimeter of the landfill at locations where groundwater may be encountered (Figure 5-8). The gravel trench will drain to the landfill low point at the southern perimeter, and prevent groundwater from entering the landfill cell during excavation and filling operations. The gravel trench is to remain operational following the closure of the landfill to prevent groundwater impacting the closed landfill.***~~

~~***The gravel trench will be typically 900 millimetres wide with 100 millimetres gravel installed with a geofabric surround. Depth of the trench will be to the 'average' groundwater level. Refer to Figure 5-9 for the typical cross section of the groundwater interception trench.***~~

~~***For further information on groundwater conditions refer to the Hydrogeological Assessment in Appendix F.***~~

To avoid any risk of groundwater infiltration into the landfill cells, a groundwater collection system will be installed between the base of the landfill liner and the final excavation layer. The groundwater collection system is described in detail in Appendix C of the RtS. In summary it would comprise the following key elements:

- ***Installation of a collection/drainage layer***
- ***Installation of a geotextile layer (if required)***
- ***Installation of collection pipes***
- ***Installation and operation of sumps and risers***

These elements are described in greater detail below.

Collection/drainage layer

The purpose of the collection/drainage layer would be to manage groundwater inflow rates and resulting hydrostatic upward pressure under the predicted maximum potentiometric head conditions. The most likely design option for the collection/drainage layer is through the installation of collection trenches containing a high-permeability granular material and perforated pipework (refer to Figure 1-10 below). A herringbone pattern of trenches would use gravity to drain the groundwater to a main header pipe and sump system for extraction. Further design detail of the drainage layer is provided in Section 6 of this RtS.

The suitability of the collection pipe design will be confirmed within the detailed design phase. An alternate option, using geo-composite drainage nets is also considered suitable (described in Appendix C of this RtS). In addition, a geotextile layer can be placed between the base of the landfill and underside of the clay capping layer if the groundwater properties are found to be likely to result in clogging of the proposed system.

Collection pipework

To ensure sufficient transport time (including allowance for redundancy) a network of collection pipes in a chevron/herringbone pattern would be installed. The collection pipes would comprise 100 mm HDPE diameter laterals spaced nominally 50 m on centre, and a central 200 mm diameter header pipe. Trench size and spacing will be confirmed during detailed design. Further design detail regarding the nature of the collection pipework is provided in Appendix C of this RtS.

Sumps and risers

A sump would be located at the lowest elevation of the base, serving to collect the groundwater in preparation for removal.

The sump would contain two risers and a housing for extraction pumps. The groundwater extraction pumps would be sized with a capacity to maintain a hydraulic head that will be determined during detailed design and would correlate to a level below the base of the landfill liner. A single pump would operate in one riser under normal conditions, while a second pump would serve as standby, for use if unusually high flow rates are reported (such as under high rainfall events) or during malfunction of the primary pump. As the landfill cell sub-stages progress, the collection sump would be relocated along the main header trench/pipe to maintain the operation of the collection system. The sumps would also provide an accessible sampling point to test groundwater quality during landfilling operations and prior to discharge.

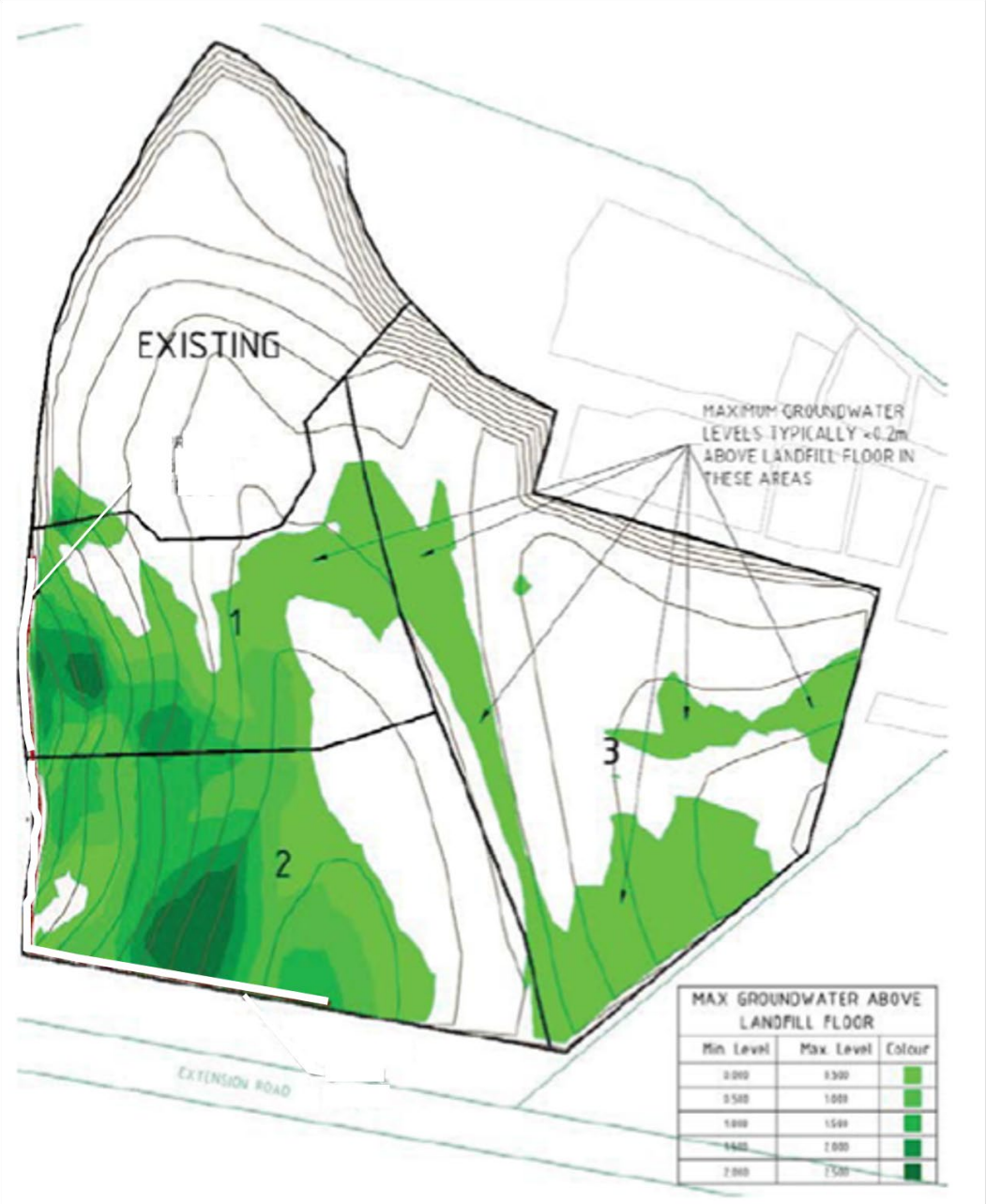


Figure 1-10 Areas where maximum groundwater levels are above the landfill floor level

~~Figure 1-11 Groundwater interception trench - typical cross section [Figure to be deleted]~~

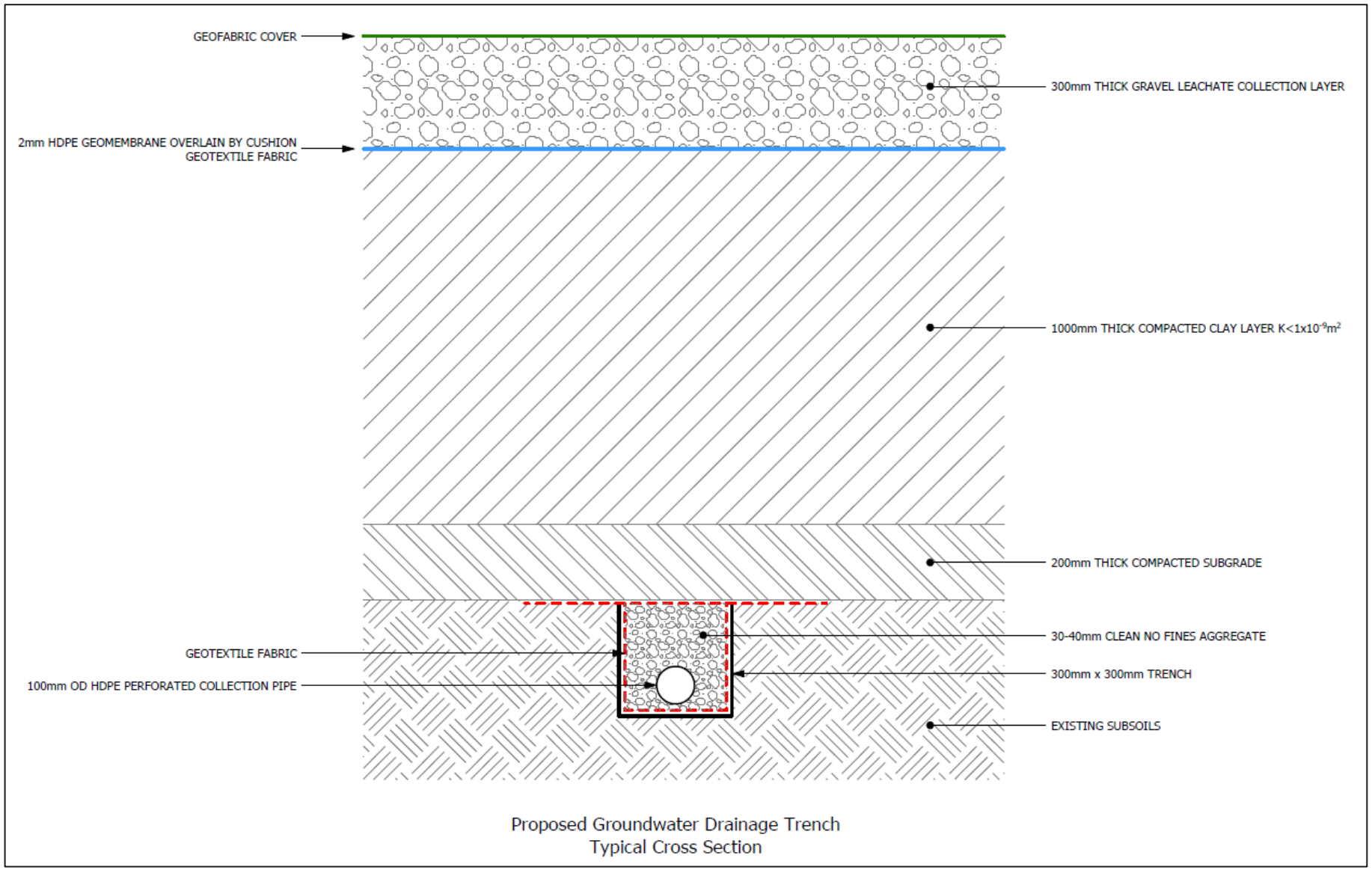


Figure 1-12 Landfill base typical cross section

1.1.5 Final landform

The original final landform for the existing and future stages was presented in the 2001 LEMP. This final landform profile has been reviewed and generally adopted for future Stages 1, 2 and 3 given it maintains a similar profile to the surrounding landscape and is lower than the surrounding tree top canopy ensuring the landfill continues to be screened.

The following slope criteria were used to refine the final landform design:

- ~~***Maximum finished landform slope of 1V:4H to allow maintenance (mowing) of finished surface after capping***~~
- ~~***Minimum finished landform slope of 1V:25H (4 percent grade) to ensure rainfall sheds from the surface and does not infiltrate the landfill***~~
- ***A maximum finished landform slope of 1V:5H (20 percent grade) to reduce the risk of erosion.***
- ***A minimum finished landform slope of 1V:20H (five per cent grade) to defined drainage points to facilitate runoff and minimise ponding of water.***
- A temporary batter of 1V:2H will be used between stages to ensure leachate and waste is contained appropriately and to limit the use of excess fill.

The proposed final landform levels are shown in Figure 1-11.

1.1.6 Earthworks and materials balance

Table 1-2 presents the estimated earthworks and materials balance for the existing and future landfill stages. While every care has been taken to estimate these volumes, actual volumes may vary following the detailed design and construction.

Table 1-2 Materials Balance Summary

Stage	E	1	2	3
Area (m^2)	***101,921*** ~~***102,063***~~	***79,453*** ~~***79,453***~~	***105,840*** ~~***103,992***~~	***161,894*** ~~***168,907***~~
Topsoil Stripping Volume (m^3)[3]	***30,576*** ~~***30,619***~~	***23,836*** ~~***23,836***~~	***31,752*** ~~***31,198***~~	***48,568*** ~~***50,672***~~
Clay Excavation Volume (m^3)	***554,219*** ~~***554,362***~~	***288,437*** ~~***290,668***~~	***290,822*** ~~***285,817***~~	***692,350*** ~~***705,181***~~
Leachate Barrier Clay Vol (m^3)	***91,729*** ~~***91,857***~~	***79,453*** ~~***79,453***~~	***105,840*** ~~***103,992***~~	***161,894*** ~~***168,907***~~
Cap Clay Volume (m^3)	***81,537*** ~~***81,650***~~	***127,125*** ~~***127,125***~~	***169,344*** ~~***166,387***~~	***259,030*** ~~***270,251***~~
Vegetation Layer Topsoil Vol (m^3)	***30,576*** ~~***30,619***~~	***23,836*** ~~***23,836***~~	***31,752*** ~~***31,198***~~	***48,568*** ~~***50,672***~~
Landfill Void Volume (m^3)	***1,438,196*** ~~***1,435,997***~~	***1,610,290*** ~~***1,610,181***~~	***1,005,030*** ~~***1,016,705***~~	***1,490,289*** ~~***1,541,718***~~

[3] Assumes 300 mm depth of topsoil.

Stage	E	1	2	3
Day Cover Clay Required (m^3) (10% of void)[4]	***143,820*** ~~***143,600***~~	***161,029*** ~~***161,018***~~	***100,503*** ~~***101,671***~~	***149,029*** ~~***154,172***~~
Actual Landfill Void Volume (m^3) (less day cover volume)	***1,294,376*** ~~***1,292,397***~~	***1,449,261*** ~~***1,449,163***~~	***904,527*** ~~***915,035***~~	***1,341,260*** ~~***1,387,546***~~
Total Clay Required (m^3)	***317,085*** ~~***317,107***~~	***367,607*** ~~***367,596***~~	***375,687*** ~~***372,050***~~	***569,953*** ~~***593,330***~~
Clay Balance (m^3) (-ve = deficit)	***237,133*** ~~***237,255***~~	***-76,170*** ~~***-76,925***~~	***-84,865*** ~~***-86,233***~~	***122,397*** ~~***111,851***~~

A summary of each stage's earthworks is presented below.

Stage E: Excess clay excavated is in the order of 237,000 metres^3. This clay is presently stockpiled on site for use within future stages.

Stage 1: Clay deficit for this stage is due to reduced excavation depth, increased final capping thickness and higher day cover volume (compared with Stage E). The estimated clay deficit will be addressed by the excess clay stockpile from Stage E.

Stage 2: Clay deficit is due to reduced excavation depth, increased final capping thickness (compared with Stage E). Reduced landfill void volume due to floor and final landform intersecting existing ground levels. The estimated clay deficit will be addressed by the excess clay stockpile from Stage E.

Stage 3: Excess clay excavated from this stage is in the order of ~~***112,000***~~ ***122,000*** metres^3.

Overall excess clay from all stages expected to be in the order of ~~***186,000***~~ ***195,000*** metres^3.

PMHC anticipate this excess material will be classified as virgin excavated natural material (VENM) and will be temporarily stockpiled on site, prior to removal for offsite application on future council civil or road work projects (under separate approvals, where required). Potential re-use applications include filling development land above flood levels, widening road embankments, bridge abutments and approaches.

Re-use of this excess material is in line with PMHC's strategy to avoid waste. Compaction and permeability testing will be undertaken at the time of extraction to determine its suitability for the various uses. This information will be recorded along with quantities estimated via volumetric surveys for EPL/waste levy requirements.

[4] Based on actual measured volumes within Stage E needed to achieve 150 mm daily cover.

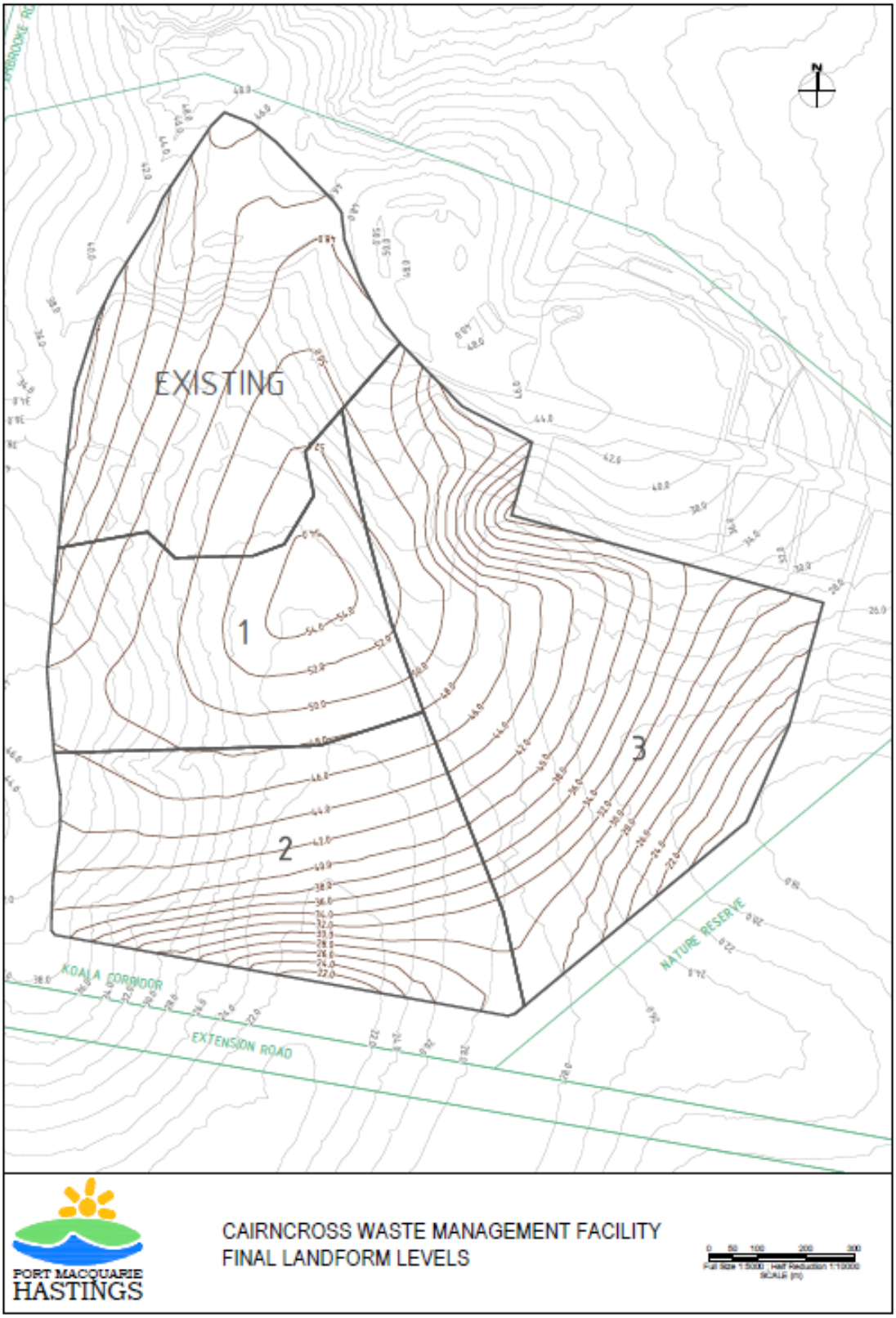


Figure 1-13 Final landform levels

1.2 Built form and infrastructure

1.2.1 Fencing

Chain wire fencing will be installed around the active landfill stage. The Koala corridor will remain unfenced until Stage 2 is developed, at which time a fence will be installed between the Stage 2 area and the Koala corridor. ***Fencing is depicted on Figure 1-2 to Figure 1-4.***

1.2.2 Waste processing areas

No waste will be processed as part of the ***Amended*** Proposal. Loads will be inspected on entry to the ***Amended*** Proposal Site for dangerous or other unacceptable materials and, if found present, entry to the landfill for disposal will be refused. Where suitable facilities exist for the processing or disposal of waste on other parts of the Cairncross WMF, drivers will be redirected to those facilities.

1.2.3 Water storage

Operational water for dust suppression, irrigation and firefighting will be collected in the sediment basins (to be constructed below each stage) and the firefighting dam (see Figure 1-1 to Figure 1-4). The volume of the existing fire-fighting water storage dam is approximately 3000m^3. This storage dam would remain in its current location during Stage 1 and 2, being relocated to the eastern side of Stage 3 prior to the commencement of landfilling in the Stage 3 area.

1.2.4 Internal roads and fire trails

Internal roads and fire trails will be constructed as required from recycled concrete or external rock from existing quarries as follows:

- A 20 metre wide defendable space would be provided to each Leachate Tank
- The existing fire trail adjacent to the south-eastern boundary would be upgraded and maintained to provide an all-weather access having a width of four metres within a six metre corridor kept clear of shrubs and grasses. The trail would be located within the Strategic Fire Advantage Zone and shall be constructed to provide access for a fully laden 15 tonne [GVM] Rural Fire Service/State Forests Category 1 Tanker
- The existing Fire Trail to the west of Stage 1 & 2 and between Stages 2 & 3 shall be retained and maintained to provide an all-weather access for a fully laden 15 tonne [GVM] Rural Fire Service/State Forests Category 1 Tanker
- A 30 metre wide Strategic Fire Advantage Zone ***(SFAZ)*** would be provided and maintained along the boundary with the adjoining Nature Reserve
- There would be provided to the perimeter of each incremental landfill cell a temporary fire trail which connects to the existing/proposed perimeter/internal fire trail network. The temporary trail would be capable of carrying a fully laden NSW Rural Fire Service/State Forests Category 1 Tanker.
- All roads will be graded and drained through silt traps and sedimentation ponds before discharge from the site.

A typical cross section of access roads and the SFAZ (and Koala Corridor) along the Stage 2 and 3 boundaries is provided in Figure 1-12 ***below.***

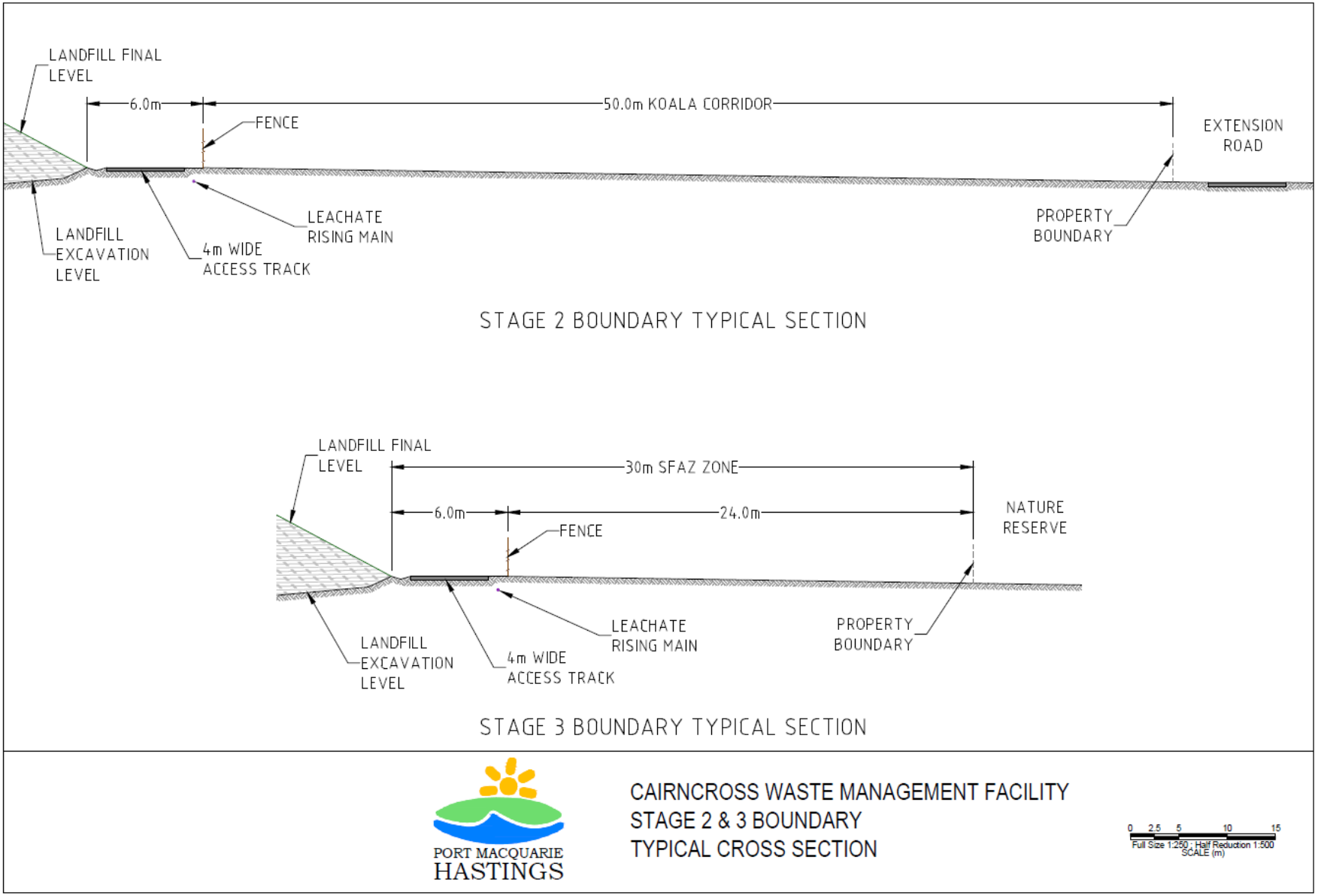


Figure 1-14: Stage 2 & 3 Boundary Typical Cross Section

1.2.5 Signage

Directional signs are already provided at the intersection of the Pacific Highway and the Cairncross WMF entrance gate and at the weighbridge. Signs advise motorists of speed limits, hours of operation, charges, types of waste accepted and other relevant information. Some minor additional signage may be required as part of the ***Amended*** Proposal for the three stages.

1.3 Stormwater management strategy

1.3.1 Existing system

The initial site selection within the head of a catchment has ensured that necessary surface drainage controls will be limited to the operational area of the landfill and a small lateral catchment area immediately adjoining the landfill.

The overarching principle guiding water management on the site is to discretely capture clean water and dirty water from the ***Amended*** Proposal Site so that it can be used on site to minimise external water supply requirements or be treated prior to discharge or evaporation. This includes the requirements for appropriate erosion control, sediment control and stormwater management.

There are currently a number of surface water management features in place at the site. The primary objective of the surface water management features is to ensure that relevant water quality objectives are achieved for stormwater discharged from the site. These measures will continue to be implemented as described in Section 1.3.2.

1.3.2 Proposed stormwater management system

The stormwater management details for the ***Amended*** Proposal are shown in Figure 1-1, Figure 1-2, Figure 1-3 and Figure 1-5:. Stage 1 and Stage 2 would drain via a broad ephemeral gully (A) south via a culvert under Extension Road to land owned by State Forests NSW (Forestry Corp). While Stage 3 drains via an ephemeral gully (B) to Rawdon Creek Nature Reserve in the east.

The final landform (see Figure 1-13) will redirect stormwater runoff from the western ephemeral gully (A) to the eastern ephemeral gully (B). At the completion of filling operations approximately 4.3 hectares will be redirected from the eastern ephemeral gully A catchment to the eastern ephemeral gully B catchment.

This small redirection of stormwater runoff is not considered to be significant and not expected to impact the downstream environments given both gullies (A) and (B) ultimately drain to Rawdon Creek, approximately two kilometres to the south of the Cairncross WMF via generally ephemeral watercourses. In addition, the overall catchment size is approximately 1,000 hectares, and the redirection of 4.3 hectares represents only 0.4 percent reduction in the local sub-catchment.

The stormwater management strategy for Stage 1, 2 and 3 will maintain and improve upon existing techniques implemented in the existing Stage E landfill operation area. The general approach for stormwater management at each future stage will include the following aspects:

- Internal roads are gravelled to prevent softening and erosion during wet weather
- Roadside table drains and drainage channels are constructed where required to direct stormwater away from erosion prone areas
- Table drains and channels are grassed or rock armoured to prevent scouring
- Sediment traps are used where possible to collect sediment prior to stormwater reaching the sediment basin

- A large sediment basin is utilised as end-of-line treatment for all stormwater runoff from the site. The basin outlet is controlled via a manual valve which is generally released five days after a rainfall event to ensure maximum sediment capture. The basin is cleaned as required. Spillways are to be provided to all sediment basins and designed for major storm events (up to 100-year average recurrence interval (ARI))
- Covering of waste (day cover) is completed with compacted clay, trimmed and graded to encourage runoff of rainwater
- Final contouring of landfill areas is designed to assist water runoff and direct water to relevant stormwater sediment basins before being discharged from the site
- Maintenance is carried out on all stormwater infrastructure to ensure control measures are operational prior to rainfall events
- Clearing and stripping of new landfill sub-cells is done progressively to limit runoff and control sediment runoff.

1.4 Erosion control

As discussed in further detail in Section 8.3, 8.4, 8.5 ***of the EIS*** and in the Concept Design Report (Appendix B ***of the EIS***), the Proposal would incorporate the following measures to minimise the volume of sediment-laden stormwater generated from the disturbed areas of the site during rainfall events:

- Minimise the area of exposed soils
- Stabilise exposed areas
- Reduce erosive effect of stormwater
- Protect stockpiles with silt fencing
- Manage unsealed roads
- Landfill exit controls (shaker pad and wheel wash located in broader Cairncross WMF)
- Maintenance of all erosion control structures.

1.5 Sediment control

As discussed in further detail in Section 8.3 and 8.4 ***of the EIS***, and in the Concept Design Report (Appendix B ***of the EIS***), the main source of sediment control for ***Amended*** Proposal will be the staged clearing of landfill areas and inclusion of sediment basins. The staged clearing minimises disturbed areas by reducing stormwater runoff and erosion. Other measures may include vegetative buffers and silt fences. One large sediment basin would be constructed for each stage of the ***Amended*** Proposal, as shown in Figure 1-1 to Figure 1-5:, to ensure stormwater discharged from the site is of suitable quality.

As required by the Guidelines, sediment basin sizes have been calculated using the spreadsheet method supplied with *Managing Urban Stormwater: Soils and Construction Volume 2B Waste Landfills* (the Blue Book) (Department of Environment and Climate Change NSW (DECC), 2008). The sediment basins have been designed to capture and treat all sediment-laden runoff during a ~~***90th***~~ ***95th*** percentile five-day rainfall event. See ~~***Appendix B***~~ ***Section 6.3.3 of the RtS*** for further information on sediment basin design.

1.6 Leachate management strategy

1.6.1 Existing leachate barrier and collection system

A leachate barrier system is installed within the floor of all Stage E sub-cells comprising compacted clay 900 millimetres thick (max. permeability $1x10^{-9}$ m/s).

A leachate collection system (2 x 100 millimetres ~~***PVC***~~ ***high density polyethylene (HDPE)*** slotted drainage lines covered with 100 millimetres diameter crushed rock) convey leachate to a collection tank where leachate is pumped to leachate infiltration/recirculation basins. When leachate volumes exceed infiltration capacities, leachate is transported off site to a STP.

1.6.2 Proposed leachate barrier system

A landfill cell liner (leachate barrier system) is to be constructed for Stage 1, 2 and 3 of the Proposal in accordance with the Guidelines. The liner would comprise:

- 200 millimetres thick compacted clay sub-base
- 1,000 millimetres thick compacted clay liner (hydraulic conductivity $<1x10^{-9}$m/s)
- 2 millimetres thick HDPE flexible membrane liner
- Cushion geotextile fabric to protect the HDPE liner
- 300 millimetres thick gravel leachate collection drainage layer including leachate collection pipes (2 x 100 millimetres slotted ~~***PVC***~~ ***HDPE)*** at intervals of 25 metres). NB: Refer to Pacific Environment Limited report *Cairncross Landfill Leachate Generation Modelling (2016)* for sizing details.
- Separation geotextile fabric to reduce the ingress of fines from the overlying waste.

Refer to **Figure 1-12** for a typical section of the proposed leachate barrier system.

~~***Figure 1-15 Landfill cell liner typical section***~~

1.6.3 Proposed leachate collection system

The leachate collection network has been designed in accordance with the Guidelines. Refer to Figure 1-1 to Figure 1-5: for the leachate collection system layout.

The Cairncross Landfill Leachate Generation Modelling (Pacific Environment, 2016) (Leachate Report) (Appendix H ***of the EIS***) report confirmed that: *leachate reticulation pipes utilised for Stage E (2 x 100 millimetres diameter pipes), will be suitable for all future stages with regards to discharge velocity and flow rate.* The Leachate Report also provides information on leachate flow rates for each stage/catchment.

The leachate collection system will comprise a network of two x 100 millimetres slotted ~~***PVC***~~ ***HDPE*** pipes***)*** within a 300 millimetres thick gravel layer covering the landfill liner. The maximum spacing of leachate pipes will be 25 metres, laid at longitudinal grades of >one percent, and >three percent transverse grade.

1.6.4 Leachate storage and disposal

Recommendations within the Leachate Report (Pacific Environment, 2016) regarding leachate tank design have been adopted for the ***Amended*** Proposal. The tanks will:

- Be above ground bunded tanks
- Have sufficient leachate storage volume, as determined by using a water balance methodology

- Have a visible marker to indicate the bottom depth of the required freeboard
- Be surrounded by a bund with a capacity of at least 110 percent of the tanks volume.

Leachate will drain by gravity to a leachate tank and pump system. Refer to Figure 1-1 to Figure 1-4 for the leachate tank and pump system layout.

The leachate storage tanks are sized to accommodate two days storage of leachate at the maximum predicted rate. The flow rates, typical layout and cross section for the proposed leachate storage tanks are detailed in the Leachate Report (Appendix H ***of the EIS***). ***The capacity of the tanks have been designed to cater for a 'worst case' scenario allowing for a wet weather event to occur over a weekend period.***

Construction commenced in 2016 for a new leachate tank location to serve the remainder of Stage E and for Stage 1. This new tank location (within Stage 2) is in accordance with the 2001 LEMP *a*nd OEMP.

The tanks will initially be pumped via rising main to the existing infiltration basins. However, PMHC will shortly commence construction of a new STP to be built within the Cairncross WMF Industrial Precinct. Once complete, the leachate from the Proposal will be pumped to the STP for treatment and disposal from the site.

The new STP itself does not form part of this ***Amended*** Proposal. The STP will be managed by PMHCs Water and Sewer section and is being specifically designed to accommodate the leachate characteristics and estimated flow rates. The new STP will provide sufficient treatment to allow disposal of effluent (including treated leachate) to the environment in accordance with the POEO Act administered by the NSW EPA.

Leachate volumes will be measured by flow metres before entering primary holding tanks within the STP. These holding tanks are expected to provide further storage capacity if required. Typical layout and a cross section for the proposed leachate storage tanks, as well as the STP functional layout and process diagram, is provided in the Concept Design Report (Appendix B ***of the EIS***).

Due to the sizing of the proposed leachate storage tanks, capable of holding up to two days' worth of leachate at maximum generation rates, the proposed system is not dependent on the storage capacity or ability for leachate to be accepted at the STP. In the event where the STP is unable to accept leachate volumes for a period of time, PMHC would employ contingency measures. The primary contingency option for disposal of leachate would be to transport leachate offsite to the Port Macquarie STP via a tanker or to another nearby licenced facility (eg. Wauchope STP).

1.7 Landfill gas management

As discussed in further detail in Section 8.9 ***of the EIS***, PMHC has commissioned a number of investigations to estimate the predicted rate of landfill gas generation from the existing and proposed landfill stages. The predicted greenhouse gas emissions varied from study to study and this highlighted the difficulty in modelling the emissions, signalling the need for a landfill gas pumping trial at Cairncross WMF.

PMHC ***has commenced*** ~~***are currently conducting***~~ a landfill gas pumping trial at Cairncross WMF. The pumping trial is being conducted to assess the actual rate of methane generation from a 'typical' zone within the landfill, the concentration of methane during active extraction, and will provide a forecast of future extraction rates/concentrations within the landfill. The trial will also make recommendations on the future landfill gas management at the site. ***The bores used in the trial have been installed across the filled areas within the existing (Stage E) landfill cell in close proximity to the active landfill tip face. Results of the trial will be captured from mid-2019 when the bores are at an appropriate separation distance from the active landfill tip face.*** ~~***and is expected to be completed by late-2017.***~~

The extent of gas controls to be designed and implemented for the existing and future stages of landfill will be guided by the results of the gas pumping trial. PMHC will develop a landfill gas management plan based on the findings of the trial.

As required by the Guidelines, waste would be covered daily and at intermediate stages of operation to minimise the emission of landfill gas.

PMHC undertakes a landfill gas monitoring program for the Stage E landfill and this program would be continued for the Proposal as described in Section 8.9.4 ***of the EIS.***

1.8 Establishment of Koala connectivity corridor

Establishment of the Koala corridor would involve fencing off the Stage 2 landfill area adjacent to the corridor to prevent migration of Koalas onto the ***Amended*** Proposal Site. ~~***In order to maintain connectivity, the Koala corridor would not be fenced on other sides.***~~ Prior to commencement of landfilling in the adjacent Stage 2 area, a qualified ecologist would survey the Koala corridor to identify the need for weed management and/or the planting of additional Koala food trees. Depiction of the koala corridor cross-section adjacent to access roads and the extension road is provided in

1.9 Landfill operations

1.9.1 OEMP requirements and standard operating procedures

The existing OEMP for Stage E would be updated with specific chapters related to Stages 1-3 landfilling activities. Over time the OEMP will be reviewed and updated and Stage E aspects can be deleted. The OEMP would be developed in accordance with the Guidelines and would build on and consolidate the knowledge gained from operation of the existing landfill since its opening in 2000. Standard Operating Procedures (SOPs) outlined in PMHC's *Solid Waste Management: Operational Policies, Standard Operating Procedures and Safe Work Method Statements* (SOPs Manual) (PMHC, 2013) (Appendix F) would be revised where necessary to accommodate changes in operational procedures in the Guidelines applicable to Stages 1-3.

1.9.2 Types of waste accepted

The ***Amended*** Proposal would continue to receive general solid waste (putrescible and non-putrescible) as defined under the POEO Act. These waste classifications are described below. The ***Amended*** Proposal Site would also continue to accept asbestos and any waste that is below the licensing thresholds prescribed in Schedule 1 of the POEO Act. Asbestos management procedures are described in Section 1.9.5.

General solid waste (putrescible)

The following wastes (other than special waste, liquid waste, hazardous waste or restricted solid waste) have been pre-classified by the EPA as 'general solid waste (putrescible)':

- Household waste that contains putrescible organics
- Waste from litter bins collected by or on behalf of local councils
- Manure and night soil
- Disposable nappies, incontinence pads or sanitary napkins
- Food waste
- Animal waste
- Grit or screenings from sewage treatment systems that have been dewatered so that the grit or screenings do not contain free liquids
- Any mixture of the wastes referred to above.

General solid waste (non-putrescible)

The following wastes (other than special waste, liquid waste, hazardous waste, restricted solid waste or general solid waste (putrescible)) are pre-classified as 'general solid waste (non-putrescible)' and would continue to be accepted for landfilling. It is noted that many non-putrescible materials would be diverted from the landfill for recycling and reprocessing at the MRF and ORRF, thereby reducing the quantities of these wastes entering the landfill. The landfill would continue to accept the following types of non-putrescible general solid waste:

- Glass, plastic, plasterboard, ceramics, bricks, concrete or metal
- Paper or cardboard
- Household waste from municipal clean-up that does not contain food waste
- Waste collected by, or on behalf of, local councils from street sweepings
- Grit, sediment, litter and gross pollutants collected in, and removed from, stormwater treatment devices and/or stormwater management systems, that has been dewatered so that they do not contain free liquids
- Grit and screenings from potable water and water reticulation plants that has been dewatered so that it does not contain free liquids
- Garden waste
- Wood waste
- Waste contaminated with lead (including lead paint waste) from residential premises or educational or child care institutions
- Containers, previously containing dangerous goods, from which residues have been removed by washing or vacuuming

- Drained oil filters (mechanically crushed), rags and oil-absorbent materials that only contain non-volatile petroleum hydrocarbons and do not contain free liquids and drained motor oil containers that do not contain free liquids
- Non-putrescible vegetative waste from agriculture, silviculture or horticulture
- Building cavity dust waste removed from residential premises or educational or child care institutions, being waste that is packaged securely to prevent dust emissions and direct contact
- Synthetic fibre waste (from materials such as fibreglass, polyesters and other plastics) being waste that is packaged securely to prevent dust emissions, but excluding asbestos waste
- VENM
- Building and demolition waste
- Asphalt waste (including asphalt resulting from road construction and waterproofing works)
- Biosolids categorised as unrestricted use, or restricted use 1, 2 or 3, in accordance with the criteria set out in the Biosolids Guidelines (EPA 2000)
- Cured concrete waste from a batch plant
- Fully cured and set thermosetting polymers and fibre-reinforcing resins
- Fully cured and dried residues of resins, glues, paints, coatings and inks
- Any mixture of the wastes referred to above.

Excluded wastes

The following wastes are excluded from disposal at the ***Amended*** Proposal Site:

- Liquid wastes
- Radioactive wastes
- Any explosive or flammable material including material derived from grease, oil, tar, shale or coal
- Any sludge or refuse material (unless it can be shown to be harmless) from any:
  - Tanning or leather processing plant
  - Petroleum or petrochemical plant
  - Chemical plant
  - Paint manufacturing plant
  - Metal treatment plant
  - Vegetable oil or mineral oil plant
  - Pharmaceutical or drug manufacturing plant
- Any material containing arsenic, cadmium, cyanide, lead, mercury, selenium and sulphide
- Any toxic inorganic material, including soluble salt of barium, boron, chromium manganese, silver or zinc
- Any toxic organic material, including any pesticide or herbicide, in particular any containing:
  - Chlorinated hydrocarbons
  - Fluorinated hydrocarbons

  - Organophosphates
  - Organochlorines
  - Carbamates or thiocarbamates and phenols
- Any soluble acid or alkali or acidic or basic compound, unless it can be shown that it may be beneficial
- Clinical wastes
- Contaminated wastes
- Cytotoxic wastes
- Hazardous wastes.

1.9.3 Waste monitoring and recording

The Guidelines require that the occupier of a landfill must implement waste acceptance, reporting and site security procedures that meet the following goals:

- Only authorised wastes must be received at the site
- Any unauthorised wastes delivered to the site must be appropriately managed and disposed of lawfully
- Statutory record-keeping and reporting requirements must be complied with
- The premises must be secure, and unauthorised entry must be prevented.

To meet these requirements, vehicles entering and exiting the site would pass through the existing weighbridge and entrance station. The weighbridge operator would inspect incoming waste, except where it is enclosed within a kerbside collection truck. Any load containing waste of a type not accepted at the depot would be refused entry at that point and the details recorded.

Where waste is acceptable, a fee would be collected or details recorded for account billing. All heavy vehicles would be weighed to determine the appropriate charge. Light vehicles and trailers may be weighed.

As noted above, the Stage E landfill will continue to operate under the existing and approved OEMP. The OEMP would be updated in accordance with the Guidelines, to include the Proposal covering Stages 1 to 3 landfilling activities.

The OEMP for the Cairncross WMF includes a range of measures to ensure the quantities of waste delivered to the ***Amended*** Proposal Site are accurately measured. These would be modified in accordance with the Guidelines, POEO Waste Regulation and *New Requirements for Weighbridge*s (NSW EPA, 2015) and will include:

- The *New Requirements for Weighbridges* require that operators must verify weighbridges against the Commonwealth National Measurement Act 1960 at least once a year for accuracy and reliability
- The weighbridges would be operational at all times. If, at any time, the weighbridges should cease operation, the EPA would be notified immediately and the weighbridges repaired immediately
- Each month, data will be provided to the EPA regarding the amount, type and source of waste according to the National Waste Classification System
- A summary report on the quantity of waste received at the Proposal site will be lodged with the EPA every 12 months
- Every six months, a survey of the site will be undertaken by a registered surveyor to confirm the volume of landfill space consumed in the previous six months. This report will be submitted to the EPA to demonstrate that the quantities of waste

recorded by the weighbridge (for the 12-month period) are the same as those committed to the landfill

- The details of all vehicles entering and exiting the site will be permanently recorded.

Supervision of tipping face

To ensure the accountability of those attempting to deposit non-authorised wastes into the landfill, tipping activities at the tipping face would be monitored whenever a delivery vehicle is present.

Any unacceptable material detected during supervision would be reloaded to the vehicles for removal by the driver and the incident recorded. If the unacceptable waste is detected after the vehicle has left, it would be separated from the tipping area by the operator and subsequently removed from the site. If the transporter of the material is known, it would be reloaded on the next visit to the facility of that transporter.

Should contaminated or hazardous material be detected on site, the area affected will be isolated until the material is contained by the Hazmat Response Team. The material would then be removed to an approved and licensed facility.

1.9.4 Landfill process and cover requirements

In practice the landform development will be continuous with many sub-stages. Waste would be placed within each sub-stage area and raised to the final level progressively.

Waste will be tipped in a defined filling area which may vary from day to day. Staff will restrict the tipping face to about 600 metres^2 (e.g. 30 x 20 metres), depending on the level of demand and where health and safety considerations allow.

Deposited waste will be progressively consolidated and compacted in layers of about 500 millimetres depth, using a wheeled compactor. Layers of compacted waste will be built up during the day's operations to a maximum depth of two metres.

As required by the Guidelines, waste would be covered daily and at intermediate stages of operation to minimise odour, dust, litter, the presence of scavengers and vermin, the risk of fire, rainwater infiltration into the waste (and therefore the amount of leachate generated) and the emission of landfill gas.

Daily cover would comprise natural site soils and would be applied at a minimum thickness of 150 millimetres. Existing daily cover is sourced from clay stockpiled from the Stage E landfill excavation. During filling of Stages 1 and 2, a clay deficit is expected for each stage, however clay stockpiled from Stage E will be available for daily cover during filling of Stages 1 and 2. For Stage 3, sufficient clay is expected to be available for daily cover from the landfill excavation (see Section 1.1.6 for details of the earthworks and materials balance for the ***Amended*** Proposal).

As progressive sub-stages are added, the temporary downstream batter may be excavated and the soil used as daily cover so that there will be no impediment to the lateral movement of leachate over the long-term.

As progressive lifts of waste are added to previously placed and compacted waste, the cover is stripped away in advance of filling over at least 50 percent of the area to be filled (on a daily basis) to allow for long-term vertical movement of leachate.

An intermediate cover of 300 millimetres will be applied to surfaces which will be unused for a period of 90 days or more. The intermediate cover will be compacted to reach a saturated hydraulic conductivity of less than 1x10-5 m/s with a compaction of 95 percent standard maximum dry density (SMDD).

Cover material will be sourced from excess excavated material from landfill cells. A detailed methodology for the covering of waste is provided in PMHC's *Solid Waste - Management Policies, Standard Operating Procedures and Safe Work Method Statements* (PMHC, 2013).

Covered sections of the landfill will be graded to drain rainfall runoff away from the tipping face. A small bund of excavated material will be maintained on the low side of the tipping face to collect and retain any runoff resulting from rainfall onto exposed waste. Runoff collected in this manner is referred to as operational leachate and will either percolate through the cover material into the landfill, or evaporate.

The cover material previously placed over the underlying layer of waste will be bladed off to expose the waste such that the newly placed waste is in direct contact with the old waste. The cover will be removed by an excavator or similar equipment. Care will be taken to prevent disturbance of waste under the cover material and avoid mixing of waste with cover which is removed and stockpiled for later use. This practice encourages vertical rather than horizontal drainage within the landfill. Excess liquid will flow to the base of the landfill to be collected by the leachate collection system.

Sections of the landfill will be raised in steps so that access gradients are manageable for tipping vehicles.

The final landform is discussed in Section 1.10.4. A 'typical' development sequence is detailed in Table 1-1.

1.9.5 Asbestos disposal management

Asbestos is currently, and would continue to be, received and disposed of to landfill in accordance with the requirements of PMHCs SOP's Manual (PMHC, 2013) (Appendix F ***of the EIS***. The procedures contain a range of SOPs, including SOP 2 which specifies requirements for the safe handling of asbestos during disposal at the Proposal Site. SOP 2 incorporates precautions such as double sealing the waste in heavy duty plastic bags, inspection of the loads by staff, depositing the waste in a designated area, use of water carts when dealing with friable asbestos and minimising the number of people in the vicinity of the asbestos disposal activity.

1.9.6 Workforce, opening hours, management hours

No change is proposed to the current workforce and operating/management hours. It is anticipated that five full-time equivalent staff[5] would continue to be required on-site to manage the landfill operations including:

- Weighbridge attendant x 2
- Landfill supervisor x 1
- Machinery operator x 2.

The landfill is open every day, with the exception of Good Friday, Sunday and Christmas Day, and would continue to operate during the following hours:

- Monday to Friday: 7am - 5pm
- Saturday, Public holidays: 8am - 4pm.

Site management activities, such as final covering operations, may continue one hour after closure.

[5] Five full time equivalent staff would equate to approximately 12 individuals.

1.9.7 Vehicles, plant and equipment

A range of mobile vehicles, plant and equipment will be used on the site. Table 1-3 provides a list of indicative equipment and their likely uses however this is subject to change over the course of operations. The table also provides an indication of the hours of use for this equipment. Traffic generation due to the ***Amended*** Proposal is discussed further in Section 8.8 ***of the EIS***.

Table 1-3 Plant and equipment

Type	Model	Size	No. on site	Used for	% of manage - ment hours in use (in 2020)	% of manage - ment hours in use (in 2040)	% of manage - ment hours in use (in 2056)
Boggy tipper	Mack	12 t	1	Excavation	30	70	90
Diesel compactor	TANA	380	1	Waste compaction	30	70	90
Excavator	Kamatsu PC 200	20 t	2	Excavation	30	70	90
Single cab diesel ute	Ford Ranger	1.9 t	2	Fuel for excavator and compactor	10	20	30
Diesel pump	Hatz	1D5OZ	2	Leachate manageme nt	20	40	60
Diesel pump	Ruggeri ni	MD 191	1	Pumping water into water cart at dam.	10	20	30
Water cart	Rapid Spray	2500 L	1	Dust suppression	10	20	30

1.9.8 Services

No services (e.g. electricity, telephone, water or wastewater connections) are to be installed as part of the Proposal. These services are available within the broader Cairncross WMF and are managed by the operators of those facilities.

1.9.9 Management of koala connectivity corridor

The Koala connectivity corridor will be managed to encourage use by native species, specifically Koalas. ~~***Management for this area would be incorporated into the OEMP to be prepared for the Cairncross WMF.***~~ ***A Vegetation Management Plan would be prepared in accordance with the OEH Guidelines for development adjoining land managed by the Office of Environment and Heritage (2013) and will include measures for the maintenance, management and revegetation of the Koala connectivity corridor and the setback area.*** The management activities would cover the following requirements:

- Initial and ongoing weed removal
- Pest animal control measures (including monitoring and trapping where necessary)

- Planting of supplementary trees and shrubs to improve the habitat value of the corridor, if required, as determined by a qualified ecologist
- The suitability of bushfire control measures to be undertaken within the corridor
- Litter removal/removal of illegally dumped rubbish.

1.9.10 Environmental monitoring

A program of environmental monitoring would be undertaken for the ***Amended*** Proposal including stormwater, groundwater, leachate and landfill gas monitoring. The monitoring requirements are discussed in Sections 8.3, 8.4, 8.5 and 8.9 ***of the EIS***.

1.9.11 Managing litter and preventing illegal dumping

Preventing illegal dumping on the access road, and reducing litter (both within the site and adjacent areas), will be a key focus of the OEMP governing the Proposal. The existing OEMP for the site includes litter control strategies and PMHC commenced a general illegal dumping program in early 2015, working in partnership with National Parks and Wildlife Services and Forests NSW as stakeholders, to help address this issue.

PMHC finalised two Memorandum of Understandings (MOUs) with NPWS and Forestry Corporation of NSW. In the MOUs, PMHC committed to a coordinated partnership approach to managing illegal dumping. Some of the key actions relevant to this Proposal include:

- Strengthening community understanding of illegal dumping issues through community education programs
- Participating in regional planning and illegal dumping projects
- Providing support for investigation, surveillance and follow up by PMHCs Compliance team
- Clean up of areas around the Cairncross WMF.

1.10 Site closure

The following section describes the final capping and revegetation program for the Cairncross WMF landfill as well as the landfill closure plan including the final landform and long-term monitoring and management plans post-closure of the landfill.

1.10.1 Landfill Closure Plan

The Guidelines require that the landfill be non-polluting and not cause environmental harm after site closure. A Landfill Closure Plan will be prepared and submitted to the EPA for approval no later than 12 months before the completion of the landfill's waste receipt operations. The Landfill Closure Plan will specify:

- The measures to be implemented when closing and stabilising the landfill
- The timeframe for implementation of these measures
- The design and construction quality requirements for the final capping
- Post-closure management and monitoring measures for leachate, stormwater, landfill gas, odour, dust, litter and final cap integrity
- Identify any proposed future use of the site
- Be consistent with all applicable conditions of the development consent

- Ensure neighbouring residents are advised of the contact persons for discussing any problems (e.g. odour emissions)
- Ensure waste is not received for disposal at the site after landfill operations cease.

Potential future long-term land use options would be investigated approximately five to 10 years prior to the landfill reaching capacity to enable sufficient lead time to secure any necessary planning approvals.

1.10.2 Rehabilitation overview

The operational practices to be implemented for the ***Amended*** Proposal would ensure that rehabilitation and restoration occurs in a progressive manner as each landfill cell reaches capacity. Progressive rehabilitation undertaken throughout the life of the ***Amended*** Proposal will reduce impacts on the ***Amended*** Proposal Site and surrounding areas. Proposed rehabilitation activities will include: implementation of the proposed final landform; capping and revegetation; and post closure monitoring and management. These rehabilitation activities will provide the following:

- A barrier to the migration of water into the waste mass, therefore reducing the amount of leachate generated and the potential for contamination of groundwater
- Surface water runoff from the landform designed to minimise unacceptable erosion or further potential environmental impacts
- A long-term stable barrier between waste and the environment in order to protect human health and the environment
- Stability of the proposed landfill to limit potential erosion and dust
- Visual integration with the surrounding area.

1.10.3 Capping and revegetation

All completed landfill cells will be capped and revegetated in accordance with the Guidelines and within six months of the final delivery of waste to the cell. The final capping and revegetation will ensure the long-term concealment of the landfill.

Capping details

The final landfill cap is to be constructed in accordance with the Guidelines, and is to comprise the following:

- 300 millimetres thick seal bearing surface (compacted clay)
- 600 millimetres thick composite sealing layer of (compacted clay hydraulic conductivity $<1x10^{-9}$ m/s).

Figure 1-6 details the staged landfilling approach to be used at the Amended Proposal Site. This staging will allow for the progressive excavation and capping of the previous sub-stage while the current sub-stage is being filled. A ‘typical’ development sequence is detailed in Table 1-1. Figure 1-11 shows the final capping/landform levels.

Material volume calculations estimate sufficient capping material for Stages 1, 2 and 3 (refer to Table 1-2 for details on the overall site material balance).

Revegetation

A revegetation layer is to be placed over the clay capping layer and will be in accordance with the Guidelines. The revegetation layer will be 1,000 millimetres thick, comprising 700 millimetres clay (lower) and 300 millimetres topsoil (upper). Revegetation is to comprise grass cover of suitable native species.

Revegetation and rehabilitation will be undertaken at the site once the landfill has reached capacity.

1.10.4 Final landform

The final landform for the Cairncross WMF, presented in the *Cairncross Waste Management Facility Landfill Environment Management Plan* (LEMP) (2001) and ~~***2008***~~ ***2015*** OEMP, has been reviewed and generally adopted for the Proposal as it maintains a similar profile to the surrounding landscape and is lower than the surrounding tree top canopy ensuring the landfill continues to be screened. The final landform levels are presented in Figure 1-13.

The following slope criteria were used to refine the final landform design:

- ~~***Maximum finished landform slope of 1V:4H to allow maintenance (mowing) of finished surface after capping.***~~
- ~~***Minimum finished landform slope of 1V:25H (four percent grade) to ensure rainfall sheds from the surface and does not infiltrate the landfill.***~~
- ***A maximum finished landform slope of 1V:5H (20 percent grade) to reduce the risk of erosion.***
- ***A minimum finished landform slope of 1V:20H (five per cent grade) to defined drainage points to facilitate runoff and minimise ponding of water.***
- A temporary batter of ***1V:2H*** will be used between stages to ensure leachate and waste is contained appropriately and to limit the use of excess fill.

The final landform design will allow for access around the entire site perimeter and to the landform summit for groundwater monitoring, site inspection, maintenance, and bushfire protection. Justification for the proposed final landform is based on minimising environmental impacts and ensuring appropriate ongoing management of the site.

The ***Amended*** Proposal Site would be maintained as a vacant site post closure and rehabilitation (i.e. no active use of the site, such as golf courses or redevelopment, is proposed at this stage). The site is not included in any future land release or rezoning investigation areas. There are no future plans for development on the site.

1.10.5 Landscaping plan

This landscaping plan covers Stage 1 to 4 of the landfill only. Landscaping of other areas within the CWMF site (eg. entrance road and weighbridge area etc) are canvassed under existing approvals and have existing landscaping in place. The site has sufficient natural buffers from the surrounding Rawdon Creek Nature Reserve and other forested areas.

As the progressive closure of various landfill stages occurs, revegetation will take place through natural regeneration. The topsoil and mulch layers used in the revegetation layer will likely provide sufficient available native grass seed that often germinates quickly given the high rainfall of the area. Revegetation will be encouraged by the eradication of weeds by spraying. When vegetation (grass) is established, eradication of weeds will continue by spraying, and poorly grassed areas will be re-seeded as necessary. Slashing will be undertaken on a quarterly basis.

1.11 Capital investment value

The CIV for the ***Amended*** Proposal, consistent with the definition provided in the EP&A Regs, is approximately $57 M Australian Dollars (AUD) (excluding GST) (refer to the Quantity Surveyor's Report prepared by WT Partnership (Appendix D ***of the EIS***).